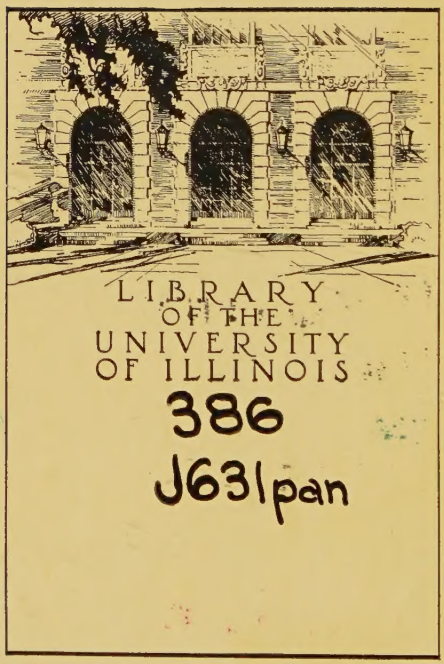
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THE PANAMA CANAL AND COMMERCE

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FIG. 1. THE *KROONLAND* IN GAILLARD CUT.

THE PANAMA CANAL AND COMMERCE

BY

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ILLUSTRATED

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CONTENTS

CHAPTER		PAGE
I.	Introduction	1
II.	Why the Canal Was Built	7
III.	The Canal and the Length and Time of Ocean Voyages	24
IV.	Services Through the Canal	48
V.	The Canal and Freight Rates	68
VI.	The Canal and the Domestic Trade and Industries of the United States	94
VII.	The Canal and the Foreign Trade of the United States	112
VIII.	The Canal and the American Marine	133
IX.	Europe's Interest in the Panama Canal	149
X.	Competition of the Suez and Panama Routes	167
XI.	Fuel Supplies and Costs via the Panama Canal and Alternative Routes	183
XII.	Panama Canal Tolls	208
XIII.	The Panama Tonnage Rules	235
XIV.	Commercial Administration of the Canal	265
XV.	What Happened when the Slides Closed the Canal	276
	Index	289

LIST OF ILLUSTRATIONS

FIGURES

1. The *Kroonland* in Gaillard Cut . . . . *Frontispiece*

PAGE

2. Midship Section, Typical Coastwise Steamer for Panama Canal Service 56

3. Profile of Typical Coastwise Steamer for Panama Canal Service 57

4. The *Santa Clara* of the Atlantic and Pacific Steamship Company . . . . . *Facing* 58

5. The *Finland* of the Panama-Pacific Line, International Mercantile Marine Company . . *Facing* 60

6. Profile of "Steam Schooner" for West Coast United States Lumber Trade . . . . . *Facing* 62

7. The *Lewis K. Thurlow* . . . . . *Facing* 64

8. Profile and Upper Deck Plan of Oil Tank Carrier, with Diesel Engines 65

MAPS

1. Western Hemisphere on a Polyconic Section . . . 9

2. Isthmus with Completed Canal 22

3. Trade Routes and Distances by the Panama Canal and Alternative Routes . . . . . *Facing* 28

PAGE

4. Points Equally Distant from New York and from Liverpool via the Panama and Suez Routes . . 41

5. Rate Zones Established by Interstate Commerce Commission in Adjusting Rates to Intermediate Western Points 76

6. Transcontinental Rate Groups 78

7. Principal Coaling Stations of the World . *Facing* 192

THE PANAMA CANAL AND COMMERCE

CHAPTER I

INTRODUCTION

In the year 1791 six vessels sailed from Nantucket and New Bedford around Cape Horn to seek whales in the Pacific. During the century and a quarter that intervened between this voyage of the first whaling fleet to the Pacific, via the circuitous route around South America, and the opening of the canal, the American people were more and more impressed with the necessity of piercing the barrier which the isthmus raised against the passage of ships from ocean to ocean.

By the settlement of the Oregon boundary dispute and by the war with Mexico the United States acquired a long frontage on the Pacific. Within the territory secured from Mexico were the deposits of gold that had been discovered while the war was still in progress, and the rush of gold seekers to California in 1848 and 1849 induced American capitalists promptly to undertake the

construction of the Panama Rail Road, which was opened in 1855.

Another group of men, headed by Cornelius Vanderbilt then prominent in ocean shipping and soon to become the dominant figure in railway affairs, formed a company which secured the right to construct a canal via the Nicaragua route. This project did not get beyond the stage of investigation, but numerous surveys and studies of various transisthmian routes from the Isthmus of Tehuantepec to the Atrato River were made from 1850 to 1880; and then, in the eighties, a company of Frenchmen headed by the famous builder of the Suez Canal made a heroic but unsuccessful attempt to construct a Panama canal. While the French were at work at Panama a company of Americans made a small beginning with the excavation of a Nicaragua canal, but failed financially in the early stages of the undertaking.

With the failure of private enterprise both at Panama and at Nicaragua, the Government of the United States began a serious study of the problem of securing a canal across the American Isthmus. After three commissions created during the closing decade of the nineteenth century had successively made surveys and reports, the United States adopted the Panama route, bought out the French Company, secured, not from Colombia as was attempted, but from the newborn

Republic of Panama, the necessary concession and rights, and incidentally obtained from Great Britain such a modification of the Clayton-Bulwer Treaty as made possible the construction, operation, and defense of an isthmian canal by the Government of the United States instead of by a corporation. Work was begun in 1904, and ten years later the Panama Canal was opened for the use of vessels of commerce.

The French failed in their attempt to build the Panama Canal, partly, but not entirely, because, being a private corporation, those who controlled it were obliged to raise large sums of money under adverse conditions and thus yielded to the impulse to promote the enterprise by indefensible financial methods. The company was confronted by an obstacle more serious than its financial troubles. The failure of the enterprise was due primarily to the fact that at the time the company undertook the work it was not known that yellow fever and malaria were transmitted from one person to another by the stegomyia and anopheles mosquitoes and that, by preventing these mosquitoes from breeding in the places where men live, the deadly yellow fever and the energy-destroying malaria might be eliminated. Experience has since shown that it is practicable, by sanitary and quarantine regulations properly enforced, to eradicate yellow fever completely, and

to reduce malaria to small proportions even in places like Cuba and Panama which in the past have suffered terribly from fever.

This fact was demonstrated by the medical officers of the United States army in connection with the sanitary work done in Cuba following the Spanish-American War. The work done at Havana from 1898 to 1901 by Doctors Reed, Sagaer, Carroll, and Agramonte in demonstrating that the stegomyia was the transmitter of yellow fever, and by Colonel Gorgas who applied the theory to the sanitation of Havana, made it possible for the United States to convert the Canal Zone from a section where yellow fever had long been endemic and violent malarial fevers had been prevalent, into one of the most healthful regions of the world.

Fortunately for the United States and especially for the army of laborers and their families who have lived in the Canal Zone since 1904, the sanitary work at the Isthmus was placed in charge of Colonel Gorgas, the man who, by driving yellow fever out of Havana, had shown his ability to cope with difficult problems of practical sanitation. How Colonel Gorgas, who is now Major General, and Surgeon General of the United States army, did his work at Havana and at Panama has been delightfully told by himself in his book on *Sanitation in Panama.*

Those who have not personally run the risk of

yellow fever infection can hardly realize how great was the danger from the dread disease at the Isthmus of Panama, and other places where the disease was endemic, before it was known that the mosquito was the agent of infection. In March, 1900, the writer was at Panama with the Isthmian Canal Commission and spent about three weeks inspecting the canal route and the work that had been done by the French Company. He and his wife, who was with him, were so fortunate as to occupy a cottage that was placed at their disposal by the late Colonel J. R. Shaler, then the superintendent of the Panama Rail Road. The cottage was located directly on the Caribbean shore and the refreshing trade winds, blowing day and night, made life most comfortable, and the visit to the Isthmus most enjoyable. There was no special thought of danger from yellow fever. Not long after, however, Colonel Shaler was visited by his three sisters who occupied the same cottage. One after another the three ladies were infected with yellow fever and all died of the disease. Such a tragedy as this helps one to realize what was gained for the people who have lived and worked in the Canal Zone, and for the construction and operation of the canal, by the extermination of yellow fever from the Zone. Indeed, the sanitation work at Panama has benefited the entire world for all time.

When, in 1905, yellow fever had been done away with and the department of sanitation had gotten malarial fevers well under control, the chief obstacle to the economic and rapid progress of the work of construction had been overcome. It was then possible for the Isthmian Canal Commission to secure, maintain, and keep in healthy efficiency the force required in each branch of the work. How the problems of engineering, administration, and construction were worked out by the successive chief engineers—that is, how the canal was built—is described by Brigadier General William L. Sibert and Mr. John F. Stevens in their book, *The Construction of the Panama Canal.*

This volume on *The Panama Canal and Commerce* is intended to explain why the canal was built, and to discuss the use of the waterway by the commerce and shipping of the United States and other countries. The commercial services being rendered by the canal are described, and an explanation is given of the schedule of tolls and the tonnage rules in force at the Isthmus. The discussion is addressed to the man engaged in shipping and also to other students of the canal in relation to commerce. The volume is the third in the series of which *Sanitation in Panama* by General Gorgas and *The Construction of the Canal* by General Sibert and Mr. Stevens are the first and second volumes.

CHAPTER II

WHY THE CANAL WAS BUILT

The Panama Canal was built to shorten the length and time of voyages made by merchant vessels and war ships between the Atlantic and Pacific oceans. It has been said that, for the people of the United States, the canal is a commercial convenience and a military necessity. Whether this generalization places undue emphasis upon the military value of the canal will be determined by future events; but, for the present, it seems more accurate to say that the Panama Canal has been constructed primarily to remove the chief physical obstacle to the development of the maritime commerce of the United States, and that the naval and military benefits of the canal, important as they are or may become, are to be ranked second in value in comparison with the commercial services of the waterway.

Until the opening of the canal the strip of land forty miles wide separating the two oceans at the Isthmus of Panama compelled vessels voyaging between the two seaboards of the United States, or between any point in the north Atlantic

and any point on the west coast of North or South America, to make a detour around a large continent which reaches 56° south of the equator, and lies to the east not only of the Isthmus of Panama, but also of the greater part of North America. Viewed from the standpoint of the United States, South America should have been named Southeast America. As is shown by Map 1, the line of 80° west longitude which passes through Pittsburgh, Pennsylvania, and skirts the eastern point of Florida, passes through the western part of the Panama Canal Zone, and cuts off only a very small strip of Ecuador and Peru, Point Parina, the most western point of South America, being only a degree and a third west of the line. The broad continent of South America extends eastward to 34° 50′ west longitude, the most eastern point of Brazil being thirty-nine degrees east of New York City and fifty-five degrees east of New Orleans. A north and south line touching the Azores passes only 3½ degrees, about 250 miles, east of South America.

Before the Panama Canal was constructed a steamer making a trip from New York to San Francisco had to make 39° of easting and nearly 97° of southing to pass the Straits of Magellan; i. e., the vessel, in order to reach the west coast of the United States, had to round a point eastward of New York, a distance equal to two-thirds of

MAP 1.—WESTERN HEMISPHERE ON A POLYCONIC SECTION

the width of the Atlantic, and then proceed southward to a point 64° south of Panama, the Straits of Magellan being 55° south and Panama 9° north of the equator. The vessel had to steam 13,135 nautical miles to reach San Francisco, whereas the present route via the canal is only 5,260, a saving of nearly 8,000 miles. For a voyage between New Orleans and San Francisco the canal shortens the distance nearly 9,000 miles.

The geographical reasons were more imperative for a canal at Panama than at Suez; for the continent of Africa, around which vessels from Europe and the eastern part of the United States had to sail to reach the Orient, the Indies, and Australasia before the Suez route was available, lies directly south of Europe and extends only 35° south of the equator. To pass the Straits of Magellan a vessel must steam south 20°, and to clear Cape Horn, 21° further than is necessary to round the Cape of Good Hope and the tip of Africa. Because of the difference of the geographic relation of Africa to Europe from the relation of South America to North America, the Suez Canal shortens the route from western Europe to the Orient only about 40 per cent., while the Panama Canal takes 60 per cent. off the ocean voyage between New York and San Francisco.

The Suez Canal was completed forty-five years before the waterway across Panama was

opened, in spite of the greater geographic reasons for the Panama Canal. The commercial need for the Suez waterway arose earlier, the trade of Europe having reached large proportions before the United States established a regular commerce with the Pacific shores of the American continents. However, the Panama Canal would have been built twenty-five years earlier than it was had not the sanitary and physical problems at Panama proved to be far greater than those that had been successfully handled at Suez.

It was, in fact, only ten years after the opening of the Suez Canal that a concession to construct the Panama Canal, obtained in the interest of De Lesseps and his associates, was secured from Colombia; but the task courageously undertaken by the French Company proved too great for private corporate enterprise; and by 1890, when the canal should have been completed, the company had become insolvent. Later it was obliged to step aside and leave the completion of the task to the Government of the United States which, with practically unlimited resources at its command and with a knowledge of the control of disease that was gained after the French Company suspended operations at Panama, was able to push the construction of the canal through to completion promptly and economically.

Among the influences that caused the United

States to undertake the construction of the Panama Canal, the development of the Pacific coast states and the growth of the intercoastal trade both by rail and water routes were probably the most potent. By the year 1900, it had become evident to everybody that the western third of the United States had entered upon a period of rapid development, and the demand for cheaper transportation both between the two seaboards of the United States, and also between the west coast of the United States and Europe, to which a large share of the grain, lumber and fish of the west coast states were exported, became insistent and compelling.

Before the construction of railroads to the Pacific the traffic between the two seaboards of the United States via Panama, the Straits of Magellan and around Cape Horn was active and relatively large; but, as the transcontinental railroad lines increased in number and in economy and efficiency of operation, trade moved in decreasing volume coastwise and in enlarging tonnage by rail. The tendency to use the rail lines to ship to and from the west coast was accented by the development of the middle West, whose industries came to share with the factories and markets of the Atlantic seaboard states the growing trade of the far West.

About 1900, however, the rapid economic de-

velopment of the western part of the United States created a demand for more and better facilities for transportation coastwise between the two seaboards of the United States. In 1899, the American-Hawaiian Line began to operate steamers between New York and west coast ports via the Straits of Magellan, the company having sold the sailing vessels it had previously employed in the service around Cape Horn. The Panama Rail Road Steamship Line between New York and Colon and the Pacific Mail Steamship Company between Panama and San Francisco continued their joint service via the Isthmus of Panama.

A rapid growth in the intercoastal coastwise traffic began in 1907, when the American-Hawaiian Line abandoned the long route via the Straits of Magellan and started a service via the Isthmus of Tehuantepec and the Mexican National Railway connecting Puerto Mexico and Salina Cruz. During the succeeding five years the total intercoastal water-borne traffic, including Hawaiian sugar, nearly doubled and exceeded 1,100,000 tons in 1911. The rapid growth of this intercoastal coastwise tonnage, in spite of the expense of the transfer and double handling of goods at Tehuantepec and at Panama, shows clearly the commercial demand that had arisen for an isthmian canal that would make possible the expeditious and economical shipment of commodities coastwise be-

tween the two seaboards of the United States.

The relation of the Panama Canal to the trade between the eastern part of the United States and the west coast of South America is second in importance only to the relation of the canal to the commerce between the two seaboards of North America. The west coast of South America lies directly south of that part of the United States that imports a large tonnage of nitrates, copper, iron ore and other materials needed in the agricultural southern states and the manufacturing eastern states; while western South America imports manufactures, lumber, petroleum and other commodities that the United States is able to supply economically. Until the canal was opened, Europe had a decided advantage over the United States in trading with western South America, and secured most of the large trade of that section of the world. The opening of the Panama route has given the United States the advantage as regards transportation costs; and the future development of the commerce of the United States with western South America will depend upon the ability of American producers, merchants and bankers to compete with Europe in merchandizing and financial methods.

The growth of the trade of the United States with western South America before the opening of the canal, and the manifest assistance which

an isthmian waterway would render that trade were among the reasons that led to the construction of the canal. Prior to 1900 the commerce of the United States with western South America was relatively small, because the major share of the exports of the South American countries bordering on the Pacific were bulky commodities that could not bear the heavy cost of transportation around South America to the United States; nevertheless the imports into the United States from those countries increased 55 per cent. during the decade ending in 1899; and, in spite of the inability of American producers to make much headway in marketing their goods in the Pacific countries between the Straits of Magellan and Panama, the total trade of the United States with Pacific South America increased 27 per cent. during this ten-year period. Then followed a rapid growth in the commerce between these sections of North and South America, the increase in value from 1900 to 1910 being 158 per cent.

The opening of the canal enabled Chilean iron ore to move regularly to Philadelphia for use at the Bethlehem Steel Works, and increased the shipments of nitrates to the United States. The European War, as well as the availability of the Panama Canal route, has favored the development of the export trade of the United States to western South America, and the advance made in the

commerce of the United States since the year 1914 is not to be attributed solely to the canal; but it is evident that the canal is to be of large service to the commerce between the Atlantic-Gulf seaboard of the United States and the Pacific coast of South America.

The commerce of the United States with the Orient and Australia during the last decade of the nineteenth century indicated clearly the need of a Panama Canal. The trade of the Atlantic seaboard of the United States with Australia, Japan, and the mainland of Asia north of Singapore increased 53 per cent. during the ten years ending in 1899. The commerce with Australia more than doubled during that decade. During the first ten years of the present century, the trade of the Atlantic and Gulf ports of the United States with the Orient, other than the Philippines, did not make rapid progress. There was a gain of about 34 per cent. in the commerce with China, but a loss in the trade carried on with Japan from the eastern part of the United States. The Pacific ports of the United States made headway in trading with Japan as well as with China; but Europe, aided by the Suez Canal, had the advantage of the Atlantic seaboard of the United States in securing the commerce of the Orient. In the commerce of Australia and New Zealand, however, the showing made by the United States was

more favorable, the increase from 1900 to 1910 being about 68 per cent.

Since the closing years of the nineteenth century, Europe and the United States have been giving special consideration to the importance and possibilities of the trade with Pacific countries. During the first ten years of the century the commerce of ports on the Atlantic-Gulf coast of the United States increased about 73 per cent. The desire to enable the United States to compete more easily and successfully for the potentially large commerce of the transpacific countries, some populous and others sparsely settled, but all in the early stages of commercial development, was one of the reasons why the Panama Canal was built.

Statements as to the past growth of commerce do not fully indicate the interest of the United States in the countries bordering the Pacific. The fact that the United States is without ambition to acquire additional territory in or about the Pacific, and it is a fact, does not lessen the importance to the United States of acquiring a position of economic and commercial leadership in the Pacific. A nation such as the United States may be ambitious to expand its financial and trade influence without being territorially or politically covetous; and it would seem clearly to be not merely the privilege but the duty of the United

States to engage in friendly rivalry with the countries of Europe in measures to develop the resources of the lands of the Pacific, and to build up an ever-enlarging commerce between the United States and the countries that have been aided by American capital and enterprise.

The construction of the Panama Canal may be regarded as one of the means justifiably adopted by the United States to aid American producers, traders, and financiers in increasing and extending their helpful activities in the countries about the Pacific. Happily, in this instance, as is so often the case, the United States in helping itself has assisted other countries. The Panama Canal has been constructed and will be operated not merely to serve as an agency of the commerce of the people of the United States. The United States, in the exercise of an international trusteeship, has opened between the Atlantic and Pacific a gateway for the passage of the commerce of all nations under terms of entire equality. By the use of the Panama Canal, Europe as well as the United States may take a larger part in the economic development of the countries upon the Pacific coast of North and South America, and in consequence enlarge the volume of the commerce of Europe with all American countries beyond the Panama gateway.

It is for commercial purposes rather than for

military uses that the canal has been built. A nation that maintains an army and navy solely to preserve domestic order and to provide a means of defense against outside attack could not have been animated by military ambitions in constructing a Panama Canal. The primary object was, as has been stated, to promote the domestic industries and trade of the United States and to reduce or remove the handicap under which the American people have, in the past, competed with Europe for the enlarging commerce of the Pacific.

This statement does not conflict with the policy that the United States has adopted in fortifying the canal and establishing a naval base in the Canal Zone. It was necessary that the United States should fortify the canal in order to be able to protect the canal against attack and seizure. In case of a war against the United States, the enemy would, unless prevented by warships at sea or by fortifications at the entrances to the canal, be certain to take possession of the canal and use it to assist in waging war against the United States. The owner of the canal was obliged, as a matter of self-defense, to make the canal as secure as possible against attack.

The fortification of the canal was also made necessary by the obligation which the United States assumed, in the Hay-Pauncefote Treaty of

1901, to guarantee the neutrality of the canal. The Suez Canal is neutralized by an agreement entered into in 1888 by the principal powers of Europe. The obligation to maintain the neutrality of the Suez waterway is an international one; but the neutral use of the Panama Canal is guaranteed solely by the United States, which has solemnly promised that "the canal shall be free and open to the vessels of commerce and of war of all nations . . . on terms of entire equality," and that "the canal shall never be blockaded, nor shall any right of war be exercised nor any act of hostility be committed within it." The vessels of a country at war with the United States would necessarily be excluded from the canal, but under no other conditions will the use of the canal be denied the vessels of any nation observing the rules established by the United States for the neutral use of the waterway. To guarantee the neutral and innocent use of the canal by the naval and commercial vessels of two foreign nations at war with each other, the United States must be in a position to protect the canal works and to enforce the regulations governing the use of the canal.

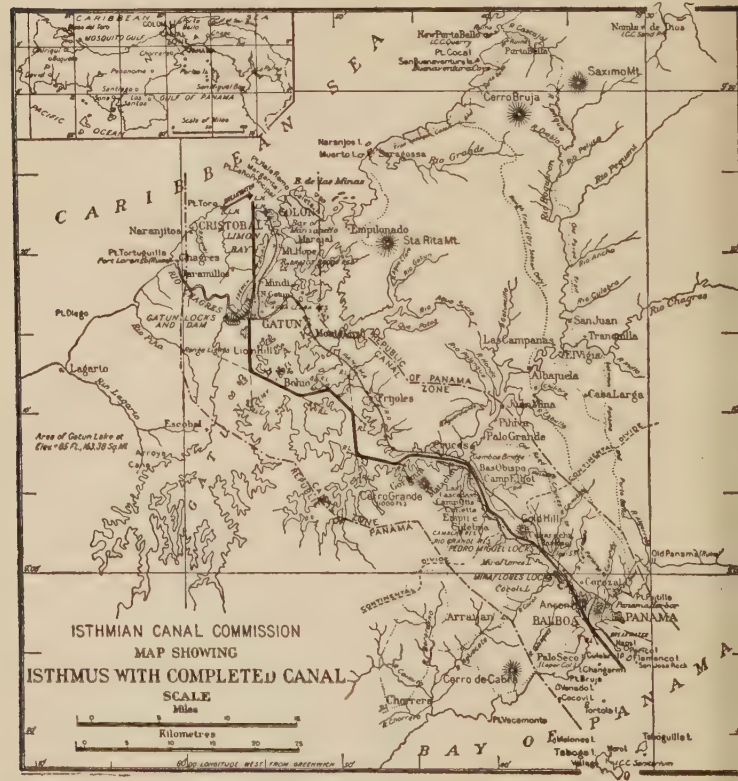
The Panama Canal has unquestionably increased the effective strength of the American navy; and, though the military purposes of the United States are defensive rather than offen-

sive, the canal may properly be regarded as a welcome military asset. The United States is open to attack from both the Atlantic and Pacific, upon both of which oceans it must maintain an efficient naval force. Until the canal was opened, the fleets that defended the eastern and western seaboards of the United States and protected the country's foreign trade were thirteen thousand miles apart. Each part of the navy had to be strong enough to do its work unaided and unsupported by the other. The effect of this upon naval operations was clearly indicated at the opening of the Spanish-American War in 1898, when the battleship *Oregon,* which was on the west coast of the United States, had to make a run of nearly thirteen thousand miles in order to join the Atlantic squadron operating in the West Indies.

The Panama Canal, by bringing the Atlantic and Pacific squadrons of the American navy closer together, has done more than to increase the mobility of the separated units of the fleet. In other ways it has added to the effective strength of the navy. The Canal Zone is a well equipped naval base with coaling stations, docks and machine shops guarded by strong fortifications. In the case of an actual or threatened war, a strong fleet can be assembled at this secure base. From the Canal Zone a squadron may go forth to strike a blow, confident of finding upon its return a secure

retreat where coal and supplies may be had, and repairs may be made.

Naval experts do not accept as correct the gen-



MAP 2

eralization often made that the canal has doubled the efficiency of the American navy. Some of the aid rendered to the navy by the canal is offset by the burden which the navy and army must

share, of defending the canal against attack and of enforcing the neutral and harmless use of the waterway at all times by all nations. While it would be impossible to strike a balance between the assistance which the canal will render the navy, and the burden which it imposes upon the army and navy, one does not need to be a military expert to realize the strategic value to the United States of having strong fortifications and a secure naval base at the sole gateway between the Atlantic and the Pacific.

CHAPTER III

THE CANAL AND THE LENGTH AND TIME OF OCEAN VOYAGES

The gold seekers of 1849 and subsequent years realized concretely and personally how the narrow Panama barrier lengthened the distance and time of voyages from the Atlantic to the Pacific. Those who crowded the small sailing vessels for passage to the west coast waited impatiently for five months while the vessels made their long passage via Cape Horn; while those who thronged the steamers that ran to Chagres and the vessels that ran from the City of Panama to California made their way across the Isthmus laboriously until the opening of the Panama Rail Road in 1855, and were most fortunate if the mosquitoes, whose bites were then thought to be only annoying, did not infect them with the Chagres fever or some other violent and dangerous form of malaria. Many of the fortune seekers traveled overland, making the weary journey from the Mississippi to the coast by "prairie schooners," braving hardships of desert and mountain and dangers of attack by Indians or highwaymen.

Twenty years after the discovery of gold in California the transcontinental railroad solved the problem of passenger transportation between the Atlantic and Pacific, but freight traffic still sought the cheaper coastwise routes between the two seaboards. Sailing vessels carried freight via Cape Horn and were continued in that service in fluctuating numbers until the opening of the canal. Some steamships were run via the Straits of Magellan rather irregularly until 1899, when the American-Hawaiian Steamship Company began a line service via the Straits, which was maintained until 1907, when the company substituted the Tehuantepec route for the more circuitous course around South America. Freight traffic between the two seaboards of the United States has moved regularly via the Isthmus of Panama since 1855 when the railroad from Colon to Panama was completed. Prior to the opening of the canal all four routes—those via Tehuantepec, Panama, the Straits of Magellan, and Cape Horn—were taken by traffic between the two seaboards of the United States and between Europe and the west coast of North and South America.

A discussion of the Panama Canal and commerce logically begins with a statement of the effect of the canal upon the length of ocean routes and the time required for voyages between Atlantic and Pacific ports. The assistance of the

canal to commerce and the economies which it will make possible in ocean transportation, are dependent upon, and roughly, though not closely, proportionate to, the reduction in distances and sailing time. In so far as distance affects the costs of transportation and the route selected by vessels, the effect of the canal upon the sailing distances between Atlantic and Pacific termini is determinative of the commercial usefulness of the canal.

It is, perhaps, desirable to note, in passing, that relative distances do not always determine the routes taken by vessels operated between widely separated ports. The largest single item in the operating expenses of vessels is fuel, and if the price of coal at stations along the longer one of two alternative routes is lower than at stations on the shorter course, the longer route may be the more economical one to take; or the saving in fuel by a shorter route that passes through a canal at which tolls must be paid may equal, in whole or in part, the tolls imposed upon the vessel. As will be pointed out in Chapter XI, the high cost of coal at stations along the east coast of South America and the relatively low price at which coal may be sold at Cristobal and Balboa afford a strong reason for the use of the canal by vessels running between Europe and central Chile, although the distance and time via

the canal are not greatly less than by way of the Straits of Magellan.

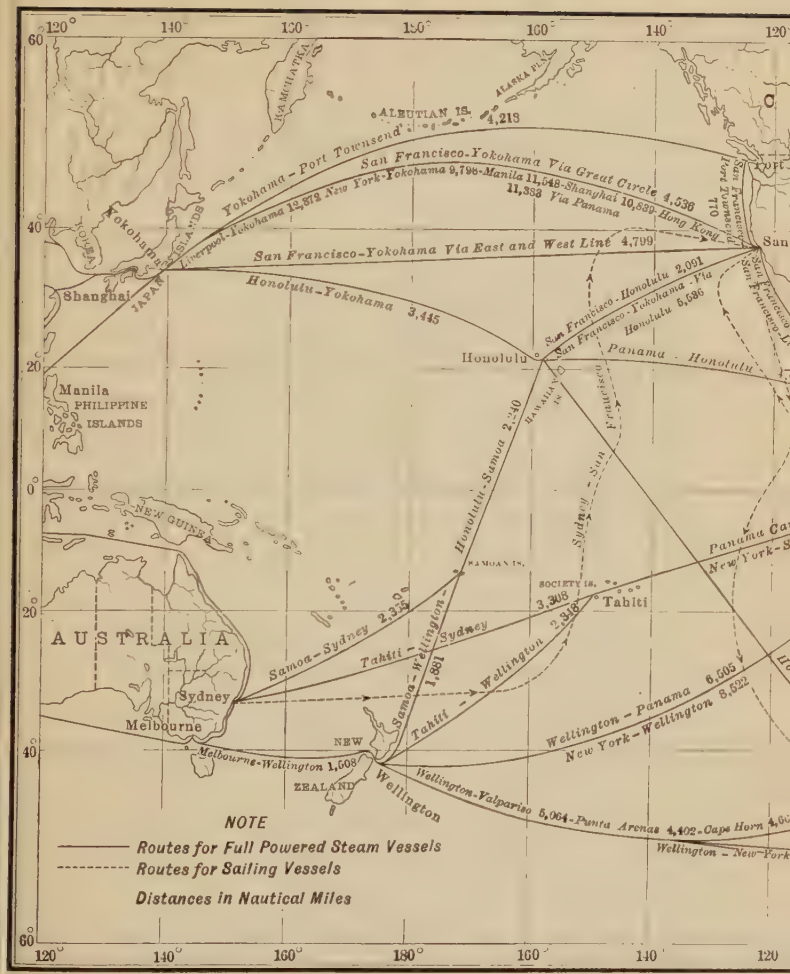
A factor other than relative distances, that affects the choice of routes by some vessels, is the traffic obtainable to and from the ports along the way. For example, many vessels from Europe to the west coast of South America take cargo to, and load return freight at, several ports along the coast from Valparaiso to Panama. If distance alone were determinative, most freight vessels plying between Europe and all the ports of Chile, except those in the northern part of the country, might go via the Straits of Magellan; but, in addition to securing cheaper coal, vessels may, by taking the Panama route, call at such of the many west coast South American ports between the Isthmus and the southern part of the populated portion of Chile as will best serve the trade in which the vessels are employed.

The greatest possible distances that can be saved by using the Panama Canal are for voyages between points on opposite sides of the Isthmus, or in general between Atlantic and Pacific ports of countries near the canal. While the canal was being constructed it was necessary to send the tug *Reliance* from Cristobal via the Straits of Magellan to Balboa. The voyage of 10,500 nautical miles took 126 days. Since the opening of the canal this vessel has several times made the run

of 44 nautical miles from ocean to ocean in half a day.

When, beginning with September 18, 1915, the canal was blocked by slides in Gaillard Cut, a large number of vessels accumulated at Balboa and Cristobal awaiting opportunity to pass through the canal. Some vessels, among others nine of the American-Hawaiian Company's fleet, after waiting a few days and ascertaining that the canal would not be opened within a month, were sent around South America through the Straits of Magellan on a voyage that added at least thirty days to the time of the trip between the two seaboards of the United States. If the canal had been open, the passage from ocean to ocean could have been made in a half-day, and the voyage between San Francisco and New York, or Honolulu and New York could have been made in two-fifths of the time required for the trip via the Straits of Magellan.

Of the routes connecting ports of the Atlantic-Gulf coast of the United States with the Pacific ports of the country, the routes from a port like Galveston on the western shore of the Gulf of Mexico are most favorably affected by the canal. From Galveston to San Francisco via the Straits of Magellan the distance is 13,727 nautical miles; while by way of Panama the distance is 4,787 miles, nearly 9,000 miles less. For voyages be-



ALEUTIAN IS.
4,218
KAMCHATKA
ALASKA PIN.
Yokohama - Port Townsend
San Francisco-Yokohama Via Great Circle 4,536
Liverpool-Yokohama 12,872 New York-Yokohama 9,798-Manila 11,548-Shanghai 10,839-Hong Kong 11,333 Via Panama
San Francisco-Yokohama Via East and West Line 4,799
Honolulu-Yokohama 3,445
San Francisco-Honolulu 2,091
San Francisco-Yokohama Via Honolulu 5,536
Panama - Honolulu
Honolulu
Yokohama
KOREA
JAPAN
ISLANDS
Shanghai
Manila
PHILIPPINE ISLANDS
NEW GUINEA
AUSTRALIA
Sydney
Melbourne
Honolulu-Samoa 2,240
HAWAIIAN IS.
Sydney - San Francisco
SAMOAN IS.
SOCIETY IS.
Tahiti
Samoa-Sydney 2,335
Tahiti - Sydney 3,308
Samoa-Wellington 1,881
Tahiti - Wellington 2,348
Wellington - Panama 6,505
New York-Wellington 8,522
Panama Ca
New York-S
Melbourne-Wellington 1,508
NEW ZEALAND
Wellington
Wellington-Valparaiso 5,064-Punta Arenas 4,402-Cape Horn 4,66
Wellington - New York
NOTE
Routes for Full Powered Steam Vessels
Routes for Sailing Vessels
Distances in Nautical Miles

tween New Orleans and San Francisco, as is shown by Map 3, the canal reduces the distance from 13,551 to 4,683 miles, a reduction of 8,868 miles. Between New York and San Francisco the ocean route is shortened 7,873 miles; i. e., from 13,135 to 5,262 miles.

The economy resulting from shortening ocean routes is best indicated by the number of days which freight and passenger vessels thereby save in making voyages. The average time taken by a 10-knot freight steamer from New York to San Francisco by way of the Straits of Magellan was 55 days. The trip via the Panama Canal now takes 22 days, a saving of 33 days, the reduction in the distance and time of the voyage being 60 per cent.

A passenger steamer which may be economically operated in the service between the two seaboards of the United States, one averaging 14 knots at sea, can make the run between New York and San Francisco in 23 days less via Panama than via the Straits of Magellan; i. e., the time required is reduced from 39 days to 16 days. The first of May, 1915, the *Kroonland* and *Finland,* relatively large vessels carrying passengers and higher grades of freight, and formerly operated between New York and Antwerp, were put into the New York-San Francisco service via the Panama Canal. Their average time between

New York and San Francisco, including a call at San Diego or the port of Los Angeles, was 17 to 19 days. Had the vessels been operated via the Straits of Magellan each run would have taken 39 or 40 days, not allowing for one or more probable stops en route for coal.

It is, however, not to be inferred from this statement that the *Kroonland* and *Finland* would have been operated via the Straits of Magellan between New York and San Francisco had there been no Panama Canal; for it would not have been profitable to run such vessels in that service, even had it been possible for the vessels, in competition with the transcontinental railroads, to secure a full complement of passengers for such a long and time-consuming voyage. The operating expenses would have taken all the revenue obtainable at rates that could be charged in competition with the rail lines.

The reduction in the time required to make an ocean voyage becomes of greater importance with the development of transportation facilities and services. Freight and passenger vessels become larger and more expensive, and thus require greater investments of capital; operating expenses for salaries, wages, and coal increase with rising wages and prices; and overhead expenses for office rents and for the personnel needed for securing and developing traffic grow larger. All this em-

phasizes the necessity of securing as many units of transportation service as practicable from each vessel operated. The shorter the length and time of each trip, the greater the number of trips that can be taken; and, as the rates charged by way of a longer route can seldom be made higher than by a shorter route, the shorter route is quite certain to be more profitable unless some special charges like canal tolls or transfer services should be so large as to offset the lower expenses and the higher efficiency of the service by the shorter route.

The American-Hawaiian Steamship Company, after dispatching its steamers via the Straits of Magellan for eight years between the two seaboards of the United States, decided, in 1907, to change to the Tehuantepec route, although to do so it was necessary to separate its vessels into two fleets, one operating on the Atlantic and one on the Pacific, and to pay the Mexican National Railway one-third of the through rate between New York and San Francisco for the railway haul of about 185 miles and the double handling of freight at the Isthmus of Tehuantepec. The distance between New York and San Francisco via Tehuantepec (4,246 nautical miles) is a thousand miles less than by way of the Panama Canal; but the time taken to ship freight between New York and San Francisco by way of Tehuantepec was four

weeks, while the time now required via Panama is three weeks. The Panama route is also much more economical although the distance is greater and tolls of $1.20 per ton on the net tonnage of vessels, amounting to 75 cents to $1.00 per ton of cargo, are collected at the Panama Canal. An account of the fleet and services of the American-Hawaiian Line is given in the following chapter.

While the commerce between the two seaboards is the part of the trade via the canal in which the people of the United States as a whole are most interested, the people in the west coast states of the United States, because of their large exports of grain, lumber, fish, and dried and preserved fruits to Europe, view the canal quite as much with reference to commerce with Europe as with regard to trade with the eastern seaboard of their own country; and for them the reduction effected by the canal in the length of routes to Europe is of special importance. The distance from San Francisco via the Straits of Magellan to Liverpool is 13,502 miles, and to Hamburg 13,883 miles, while by way of the canal the distances are 7,836 miles, and 8,355 miles, the reduction in the length of the routes being 5,666 and 5,528 miles, or 42 per cent. for the route to Liverpool and about 40 per cent. for that to Hamburg.

For the 8-knot vessels, which are most used in the large grain traffic from the west coast of the United States to Europe, the canal shortens the time at sea 23 days and reduces the operating costs per trip from port to port as much as $6,000 or $7,000. After taking from the amount thus saved the sum required to pay the tolls charged for the use of the Panama Canal, the owners or users of the vessels in this grain trade will gain $1,500 on the average for each trip made via Panama instead of by the Straits of Magellan, and will, in addition, be able, because of the reduced time spent at sea, to secure more transportation services each year, and presumably larger gross and net returns from the vessels owned or controlled.

While the trade between the west coast of the United States and Europe is large in volume, and, with the great assistance which it is receiving from the canal route, is quite certain to grow rapidly, this part of the foreign trade of the United States is far smaller in volume and value than that which is and will be carried on between the eastern seaboard of the United States and Pacific ports of South America, the Orient and Australasia. The Panama Canal has materially shortened the routes to transpacific countries and has opened a direct highway to western South America.

Valparaiso is now 629 miles nearer to New York via Panama than San Francisco is, and Iquique, a Chilean port from which a large tonnage of nitrate of soda is shipped, is 1,258 miles nearer, the distances from the Isthmus of Panama to west coast South American ports being much less than to the Pacific coast ports of the United States. The distance from the very important nitrate port of Iquique to New York is now 2,570 miles less than to Liverpool, and 3,090 miles less than to Hamburg. The Gulf coast of the United States is from 3,000 to 3,500 miles nearer Chilean ports than are the ports of northwestern Europe.

The route formerly taken by steamers from New York to Valparaiso via the Straits of Magellan was 8,380 nautical miles in length; and the distance to Iquique was 9,143 miles. By way of Panama the mileage to Valparaiso is 4,633 and to Iquique 4,004, the saving in the distance to Valparaiso being 3,747 miles and to Iquique 5,139 miles. Stated in percentages, the reductions have been about 45 per cent. for Valparaiso and 56 per cent. for Iquique. The canal has reduced the distance from New Orleans to Valparaiso 4,742 miles and 54 per cent.; while the reduction to Iquique is 6,134 miles and 64 per cent.

A 10-knot freight steamer can now make the run from New York to Valparaiso in 15 days less time, and to Iquique in 21 days less time, than

was taken via the Straits of Magellan. Such a steamer can now get from New Orleans to Valparaiso in 19 days less time than the time formerly required; while for a trip from New Orleans to Iquique there has been a reduction of 25 days. As will be pointed out in Chapter XI, the route to western South America via the canal is not only shorter but is otherwise more economical and desirable because of the cheapness of coal at Panama as compared with the high cost of coal on the east coast of South America, and also for the reason that the commercial ports of western South America lie between Panama and central Chile, whereas a vessel approaching western South America via the Straits of Magellan has a run of 1,200 miles past the sparsely inhabited southern part of Chile, a region practically without industries and commerce.

For these reasons most of the commerce between Europe and the west coast of South America, even of Chile, will use the Panama Canal instead of the route via the Straits of Magellan. The distance from Liverpool to Valparaiso via the Straits of Magellan is only 1,540 miles greater than via Panama, and from Hamburg only 1,402 miles. For a voyage from Liverpool to the nitrate port Iquique in northern Chile, the Panama route saves 2,932 miles, and from Hamburg to Iquique the saving is 2,794 miles. To the Pacific ports

north of Chile the reduction in distances is much more, Guayaquil being over 5,000 miles nearer Liverpool and Hamburg via Panama than by way of the Straits of Magellan.

Freight steamers making voyages from British and German ports to Valparaiso can save but 5 or 6 days by taking the Panama route; for voyages to the nitrate ports about 12 days can be saved; and to ports as far north as Guayaquil 21 days' sailing can be avoided by making use of the Panama Canal. Reduction in time of voyage would not alone cause vessels trading between north European ports and Valparaiso to take the Panama route and pay the tolls collected at the canal; and it is probable that many nitrate-laden vessels might take the Magellan route to avoid the tolls, if the saving in distance and time were the only economies to be secured by using the Panama Canal. Cargoes of nitrate are, in fact, moving via the canal to Europe, and it is probable that a large share of the trade of Valparaiso with Europe will pass through the canal. By taking the Panama route, vessels trading between Europe and Valparaiso may engage in the trade of the ports between Valparaiso and Panama. Moreover, vessels leaving Chilean ports with full cargoes for Europe can save a large amount in fuel expenses by using the Panama Canal instead of going by the Straits of Magellan, along

which route coal prices are exceptionally high.

For the commerce between the Atlantic-Gulf coast of the United States and the Orient—Japan, China, and the Philippines—the savings in distances and time at sea are of special importance. While the United States has a relatively large trade with the Orient, Europe has always had the lead over the United States in the commerce of the Oriental countries, with the exception of the export trade of Japan. Europe reaches the Orient via the Suez Canal; and, until the Panama Canal was built, the major share of the commerce of the United States with the Asiatic countries bordering the Pacific, i. e., the trade of the eastern and southern parts of the United States with the transpacific countries, also took the Suez route, and was thus subject to a distance handicap equal practically to the width of the Atlantic Ocean. Now that the Panama route has become available, Europe, trading via the Suez route, and the eastern part of the United States, making use of the Panama route, compete for the commerce of the Orient under equal conditions as regards transportation costs.

The aid which the Panama Canal is now giving the trade of the United States with the Orient was concretely illustrated by the voyage of the steamship *Penrith Castle* which sailed from Galveston, in October, 1914, for Yokohama with a

cargo of 3,270 tons of cotton. The distance from Galveston via the canal, San Francisco, and the Great Circle to Yokohama is 9,323 miles. Had the vessel made the run via the Suez Canal, the distance would have been about 14,575 miles by the most direct route or 15,100 miles including calls at Colombo, Singapore, Hongkong and Shanghai. The Suez route would have been about 5,500 miles longer and would have taken from 22 to 24 days in excess of the time required via Panama.

The *Penrith Castle,* in the absence of a canal at Panama, would probably not have made the run via Suez, because that route, though the most desirable one, is nearly seven-eighths the length of the routes via the Cape of Good Hope and via the Straits of Magellan. The tolls at Suez would have diverted the vessel around Africa or South America, although either one of the circuitous routes would have been more than 2,000 miles longer than the Suez route. The sailing distance from Galveston to Yokohama via the Cape of Good Hope, including the necessary calls en route for coal and supplies, would have been about 17,170 miles, and the distance by way of the Straits of Magellan would have been about 17,350 miles; but the saving in distance of 2,000 to 2,500 miles via Suez would not alone have justified the payment of the Suez tolls which would probably have been somewhat more than $4,100, the amount

of tolls which the vessel paid for the use of the Panama Canal.

The estimated daily operating expenses of the *Penrith Castle* being $230, or about one dollar per mile, the tolls would be equal to the expenses incurred for a run of over 4,000 miles. It might possibly happen that in order to secure advantages and economies other than those resulting from reduction of distance a vessel such as the *Penrith Castle* would pay $4,100 in tolls to save 2,400 miles in sailing distance, but it is probable that, if the *Penrith Castle* had taken a cargo of cotton from Galveston to Yokohama before the Panama Canal was opened, the voyage would have been made either by the Cape of Good Hope or the Straits of Magellan, and the sailing distance would have been 8,000 miles more, or 80 per cent. greater, than the distance via Panama.

The major share of the commerce of the United States with the Orient is handled through the port of New York. The distance from New York to Yokohama via Panama, San Francisco and the Great Circle course across the North Pacific—which route from Panama to Yokohama is 300 miles shorter than the apparently more direct route via Honolulu—is 9,798 miles; while the distance via the Suez Canal and the usual ports of call, Colombo, Singapore, Hongkong and Shanghai, is 13,566 miles or 3,768 miles more than via the

Panama route as designated. From New York to Shanghai via Panama, San Francisco, the Great Circle, and Yokohama the distance is 10,649 miles; via Honolulu and Yokohama, 11,137; and via the Suez Canal, Colombo, Singapore and Hongkong, 12,525; the Panama route being shorter than the one via Suez by 1,876 miles. For a 10-knot freight steamer the sailing time from New York to Yokohama would be 15 days less than via the Suez route. For a voyage to Shanghai the Panama Canal would save 7 days.

From New York to Hongkong the distances are practically the same by the Suez and Panama routes; and the same is true of the distances from New York to Manila. To Hongkong the Suez commercial route from New York is 18 miles shorter, while to Manila the Panama commercial route is 41 miles less. Commercially, though not geographically, the Philippine Islands and southern China are the antipodes of the north Atlantic ports of the United States. As is shown by Map 4, a line drawn through the points equally distant from New York by the Suez and Panama routes and the usual ports of call passes close to Hongkong and Manila and crosses the western part of Australia.

Map 4 shows the location of points equally distant from New York and Liverpool—from New York via Panama and from Liverpool via Suez.

MAP 4.—POINTS EQUALLY DISTANT FROM NEW YORK AND FROM LIVERPOOL VIA THE PANAMA AND SUEZ ROUTES

Another line on the same map is drawn through the points equally distant from Liverpool via the

Panama and Suez routes. The significance of the facts shown by this map will be considered later in Chapter X in discussing the competition of the Suez and Panama routes. In passing, it may be noted that relative distances via Panama and Suez may not altogether determine the route taken by commerce between the north Atlantic seaboard of the United States and the Orient, nor even the route taken by all of the trade between Europe and the Far East. It seems quite clear, however, that the natural commercial route from New York to Asiatic points as far south as Hongkong and Manila is via Panama and along the coast of Asia, with calls at the larger ports of Japan and China. It is equally apparent that vessels from Europe to China and Japan will, in most cases, take the route via Suez and the many possible ports of call along the southern and eastern seaboards of Asia.

One other route of major commercial importance, that between the Atlantic-Gulf seaboard of the United States and New Zealand and Australia, is much shortened by the Panama Canal. The population and industries of Australia are in the southeastern part of the island, and its commerce is carried on mainly through the port of Sydney on the southeast coast, of Melbourne on the south coast not far from the southeastern corner of the country, and of Adelaide on the

southern coast of the eastern half of the continent. Vessels approaching Australia from Europe or the United States via the Suez Canal or the Cape of Good Hope must sail nearly the length of the island continent—which extends through 40 degrees of latitude, 2,400 miles—in order to reach Sydney, the largest city and principal port of the country. On the contrary, vessels approaching Australia from the Panama Canal come at once to Sydney, and in order to make Melbourne and Adelaide need to sail only a little more than a third of the length of the island.

It is shown by Map 4 that the western part of Australia is equally distant from New York by the Suez and Panama routes; that the central portion of the island is equally distant from Liverpool, via Suez, and from New York, via Panama; and that the eastern, and, what is of most significance, the commercially important southeastern part of the country is much nearer New York—and thus to the Atlantic-Gulf seaboard of the United States—via Panama, than via Suez; and also that this southern section of the country is nearer to New York than to Liverpool and thus to the countries about, and east of, the English Channel.

The distance from New York to Sydney via the Panama Canal and Tahiti is 9,811 miles; via Suez, Colombo, and Melbourne the distance is

14,148 miles; and by way of St. Vincent, the Cape of Good Hope, Adelaide, and Melbourne, 13,743 miles. Before the opening of the Panama Canal, the route taken from New York to Australia was not the one via Suez, but the one by way of the Cape of Good Hope which was toll free and somewhat shorter than the Suez route when the usual call at Colombo was included. From New York to Sydney via Panama and Tahiti, the distance is 3,932 miles less than via the Cape of Good Hope with calls at St. Vincent, Adelaide, and Melbourne. For voyages from New York to Melbourne the Panama Canal saves 2,770 miles, and to Adelaide 1,746 miles. For the Atlantic and Gulf ports of the United States, nearer to the canal than New York is, the Panama route to Australia effects much greater reductions in distance. For New Orleans the saving is 5,444 miles, and for Galveston 5,516 miles. Gulf ports, as a whole, are now about 600 miles nearer to Australia than New York is, whereas before the opening of the Panama Canal the distance advantage was with the Atlantic ports of the United States.

The advantage which the ports of the Atlantic-Gulf seaboard of the United States have over the British and North Sea ports in distances to Australia, and especially to New Zealand, ought in the course of time to prove of real assistance to American producers and merchants in enlarging

their trade with Australia. Sydney is now 2,424 miles nearer to New York than to Liverpool. To Melbourne, New York has an advantage of 1,262 miles over Liverpool. If the comparisons were between New York and Hamburg, instead of Liverpool, the differences in favor of New York would be 519 miles greater; and if, instead of New York, the Gulf ports of the United States were taken for comparison with Liverpool and Hamburg as regards the distances to Australia, the differences in favor of the American ports would be greater by 475 miles for Galveston, 579 miles for New Orleans, and 757 miles for Port Tampa.

New Zealand, which for the size and population of the islands has a large trade, is peculiarly situated with reference to Panama Canal routes both from the United States and from Europe. Before the construction of the Panama Canal, the short route to New Zealand from Europe as well as from the Atlantic coast of the United States was by way of the Straits of Magellan; and the location of the islands between 34° and 47° south latitude is so little to the north of the southern end of South America that the distance from Liverpool to Wellington via the Straits of Magellan is only 500 or 600 miles greater than via Panama. As routes are usually charted upon maps, it does not seem possible that the distance from Great

Britain to New Zealand can be only a few hundred miles greater via the Straits of Magellan than via Panama, but when routes are charted and measured upon a globe it is seen that in southern, or northern, latitudes where the degrees of longitude are shorter than they are near the equator the distance across the Pacific Ocean is much less than in the part of the ocean which lies between Panama and New Zealand. Similarly, as stated above, the shortest route from the canal to Yokohama is not via Honolulu, but by the Great Circle route that takes vessels past the Aleutian Islands.

The Panama Canal reduces the distance from New York to Wellington about 2,500 miles and from New Orleans about 3,500 miles, and thus reduces the time of the voyage of a 10-knot freight steamer from New York about 10 days and from New Orleans 14 days. The sailing time required for a voyage by a 10-knot steamer from Liverpool to Wellington via Panama is six or seven days less than the time required via Suez and the Australian ports, and about 13 days less than the time at sea via St. Vincent, the Cape of Good Hope, and the Australian ports. As compared with the route via the Straits of Magellan, the Panama route from Wellington to Liverpool is only two or three days shorter, and, on account of the tolls payable at Panama, would not be taken unless the saving in fuel via Panama or the desire to call at ports in

the West Indies or the United States should cause the vessel's master to prefer to make the run via Panama.

Over the six general canal routes considered in this chapter—the route between the two seaboards of the United States, that between the west coast of the United States and Canada and Europe, that connecting the Atlantic-Gulf coast of the United States with western South America, that between Europe and western South America, that between the Atlantic-Gulf ports of the United States and the Orient, and that between the Atlantic-Gulf seaboard of the United States and Australasia—moves most of the traffic that makes use of the Panama Canal. During the first year of the operation of the canal 97 per cent. of the shipping that passed through the Panama Canal was engaged in commerce over these six routes.[1] The saving which the canal effects in distances and in the time of voyages by all of these important highways of ocean commerce is so large, both absolutely and in relation to distances and sailing time by the routes necessarily followed before the oceans were connected at Panama, that the canal must prove to be of much service to a large share of the world's maritime commerce.

[1] In Chapter IV, pages 53-54, the routes from the Atlantic seaboard of the United States to the Orient and to Australasia are considered as one route, thus making the general routes five in number, according to the Government's grouping.

CHAPTER IV

SERVICES THROUGH THE CANAL

The services through the canal and, indeed, over most ocean routes are of three kinds: Those of companies that own and operate lines of vessels having a definite schedule of sailings; those of the fleets owned by a few especially large shippers, such as the Standard Oil Company, the United States Steel Corporation, and the Bethlehem Steel Company; and those of vessels chartered by producers, traders, or carriers for limited periods or for single voyages. Canal traffic is thus handled by carriers' lines, producers' lines, and chartered vessels popularly called "tramps," not because of their appearance, which differs little from that of liners, nor because of uselessness or lack of steady work, for they are busily engaged in carrying the heaviest commodities of international trade, but for the reason that they are not permanently employed over any one route or in any one kind of traffic, but are the ever-busy sea rovers that seek traffic of any kind at any port.

The fleet owned by a large producer, which may

be called an "industrial line," is midway, in character of service rendered, between the carriers' fleet run as a "regular" line and the vessels operated under charter, the ocean "tramps." The vessels of an industrial line are continuously, although not always exclusively, employed in carrying their owner's traffic, but are not operated over a fixed route, unless, as in the case of an ore-carrying fleet, they transport a single commodity between two fixed ports of origin and destination. The Steel Corporation and the Standard Oil Company use their vessels to deliver their goods at ports in all parts of the world. Incidentally the vessels composing the Steel Corporation's large fleet may seek general cargo to supplement their lading. The steel products to be shipped to some distant point may be of less tonnage than the vessel employed is capable of carrying; and, as is well known, steel is such a heavy commodity that a vessel laden only with steel would be weighted down to its load line long before its cargo space had all been occupied. The more economical lading is one in which the heavy commodities are supplemented by lighter package, or measurement, freight. In soliciting this supplemental freight the owners of a vessel of an industrial line do what is regularly done both by managers of regular lines and by those in control of a vessel under charter—they sell berth space or take cargo at

special rates to secure a profitable lading for a particular ship.

The major share of the traffic through the Panama Canal has been carried by regular carriers' lines. Chartered vessels have been employed in carrying a part of the lumber, nitrate, and other heavy commodities that are shipped through the canal, and the vessels of the industrial lines have had occasion to make frequent voyages via the canal to American and foreign ports. It is probable that the use of the canal by chartered vessels has been much reduced by the European War, which has temporarily stopped the commerce of Germany and Belgium and has consequently much restricted the shipment of nitrate and other bulky commodities from the Pacific ports of the Americas to Europe—traffic especially adapted to transportation by chartered vessels.

It is probable that the traffic through the Panama Canal will always be handled mainly by line vessels, in spite of the fact that, under normal trade conditions, bulk cargoes of nitrate, lumber, sugar, coal, oil, and grain may comprise half or more of the freight carried through the waterway. Nitrate will probably be transported mainly by chartered vessels, and so will a part of the lumber, grain, and coal; but the sugar which comes chiefly from Hawaii will be carried by the

American Hawaiian Line, and most of the oil will be shipped in tank steamers owned by the oil producers.

When commerce is carried on regularly and in large volume between two countries or two sections of the world, vessel lines are established to handle most of the traffic. More or less frequently a large shipper having a full cargo of grain, lumber, steel products, or some other commodity that can be shipped in bulk will find it more economical or may even find it necessary to charter a vessel. Line vessels having fixed or approximate sailings and serving a greater or less number of regular shippers cannot accept a full vessel cargo from any one shipper, nor does a regular line vessel always have a large amount of berth space that may be sold, or assigned, to a single exporter or importer. The few exceptionally large shippers who have frequent demands for the entire capacity of a ship own vessels which they operate as a part of their business; the occasional and irregular exporter or importer having a full cargo for transportation secures a chartered vessel, and, as the total number of such irregular shippers in each country is relatively large, there is a large number of chartered vessels in service and they transport a large, though probably not a major, share of the heavy traffic of ocean commerce.

The maritime commerce of all of the belligerent

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nations has been seriously restricted by the European War, and, in the case of some of the warring countries, over-sea trade is entirely suspended. It need hardly be noted that a paralysis or even a partial interruption of the trade of several of the great commercial countries of Europe must inevitably disorganize, to a greater or less degree, not only the international exchange rates and the foreign trade, but also the domestic finances and industries of practically all countries. The finances and industries of South American countries were temporarily so crippled by the sudden outbreak of the European War that for many months their purchasing power was greatly reduced, and their trade even with the United States via all routes, including those through the canal, instead of being larger than usual as a result of the war, was for some time of less than normal volume.

The war, it is true, created an abnormal demand in Europe for foods and army supplies of all kinds, including among other articles great quantities of munitions, and this enlarged export trade, having resulted in increased shipments to Europe from the west coast of the United States and to Vladivostok from the eastern seaboard of the United States, largely and possibly quite fully offset the limiting effect which the war may have had upon the entire foreign trade of the

United States and upon the trade that makes use of the Panama Canal.

On the eighteenth of September, 1915, after the canal had been in operation for thirteen months, except for a few interruptions for periods of one to five days, slides involving a large area on each side of the cut at Culebra blocked the canal which remained closed until April 15, 1916, or for a period of seven months. The services through the canal that had been established during the first year of operation and were in existence in September, 1915, when the canal was temporarily blocked, are the services described in this chapter.

About 97 per cent. of the traffic through the canal during the first year was handled over five general routes. An account of the vessel lines operated over those routes will include most of the services through the canal. What share of the total traffic was carried by regular lines and what share by chartered vessels not operated in line services cannot be stated, but it is certain that the regular lines handled much more traffic than was transported by ships not connected with lines. The five general routes over which the regular lines were operated were as follows: (1) The United States intercoastal route; (2) the Europe-Western North American route; (3) the Europe-Western South American route; (4) the United

States-Western South America route; and (5) the United States-Far East route.

Over the first of these routes, that between the two seaboards of the United States, four lines were operating through the canal under regular schedules in September, 1915. These lines included the American-Hawaiian Steamship Company, which, under normal conditions, is able to dispatch a vessel each way every five days. The company had a fleet of 25 vessels in operation and 3 under construction. The president of the company, Mr. George S. Dearborn, in a letter written in September, 1915, stated:

> We have but 16 of our 25 vessels in the trade between New York and United States Pacific coast ports and Hawaii. Nine of these are in the service between New York and Pacific coast ports and Hawaii and seven between United States Atlantic and Pacific coast ports. The remaining 9 vessels of the fleet in commission are chartered out, some in the transatlantic trade, some in South American trade to Atlantic coast ports, and others in the South American nitrate trade to the Pacific coast. . . .

Mr. Dearborn further stated:

> Under normal conditions, the [company's] 8 steamers of 12,000 tons capacity, with two of the 10,000-ton type, would be employed in the trade to the Pacific coast ports

and Hawaii, returning with sugar—a round voyage of 15,000 miles. The balance of the fleet would be employed in the coast-to-coast trade, governed, of course, by the economic conditions of supply and demand, and those not required would be chartered for outside business.[1]

A midship section of a typical steamer of the American-Hawaiian Company's Panama Canal fleet is shown in Figure 2. Figure 3 presents a longitudinal profile of the same vessel. This

[1] The American-Hawaiian Company's fleet in 1915 included the following vessels having the designated gross and net tonnage and cargo capacity:

Steamer	Gross Tons	Net Tons	Cargo Capacity (Tons)
Alaskan	8,672	5,621	12,000
American	5,591	3,643	8,000
Arborean	Building	.....	9,000
Arizonan	8,672	5,621	12,000
Artisan	Building	.....	9,000
Californian	5,707	3,717	8,000
Columbian	8,580	5,599	12,000
Dakotan	6,657	4,068	10,000
Floridian	Building	.....	10,000
Georgian	6,606	4,016	10,000
Hawaiian	5,597	3,651	8,000
Honolulan	7,059	4,421	10,000
Iowan	6,649	4,064	10,000
Isthmian	5,404	3,469	6,000
Kansan	7,913	5,131	12,000
Kentuckian	6,606	4,016	10,000
Mexican	8,580	5,598	12,000
Minnesotan	6,656	4,068	10,000
Missourian	7,914	5,077	12,000
Montanan	6,649	4,063	10,000
Nebraskan	4,409	2,824	5,000
Nevadan	4,409	2,824	5,000
Ohioan	6,649	4,064	10,000
Oregonian	5,598	3,651	8,000
Panaman	6,649	4,064	10,000
Pennsylvanian	6,649	4,064	10,000
Texan	8,615	5,636	12,000
Virginian	7,914	5,077	12,000

ship is one of the 8 vessels added to the fleet during 1912-13. Vessels of this type are designed solely for the transportation of freight. They can average 14 knots at sea, but for the sake of econ-

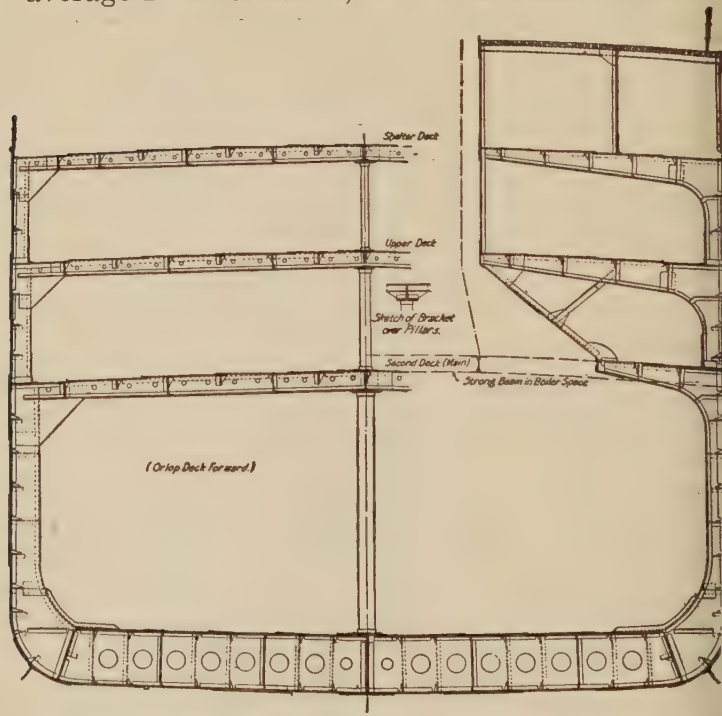

FIG. 2.—MIDSHIP SECTION, TYPICAL COASTWISE STEAMER FOR PANAMA CANAL SERVICE

omy are operated at 12 knots. The vessels are about 415 feet long between perpendiculars and of 53 feet 6 inches beam. Their molded depth to the uppermost full-length deck (shelter deck)

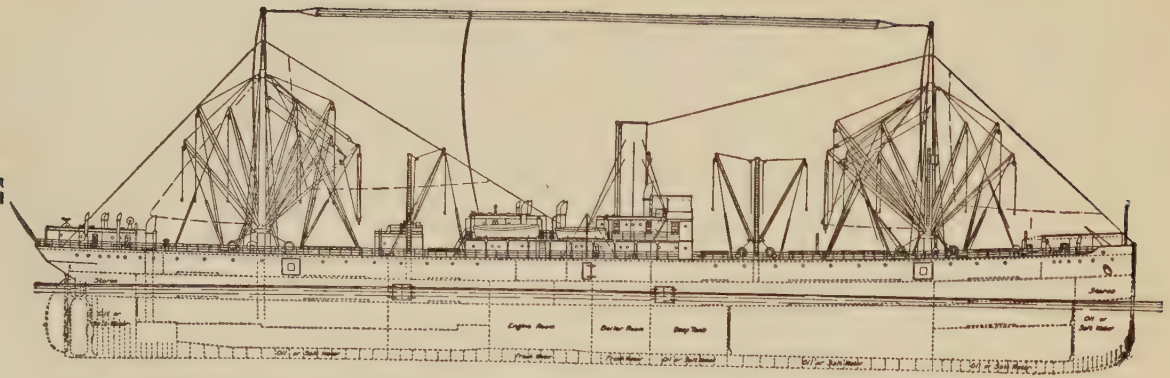

FIG. 3.—PROFILE OF TYPICAL COASTWISE STEAMER FOR PANAMA CANAL SERVICE

is 39 feet 6 inches. Their gross tonnage, American registry, is about 6,600 tons, and their net tonnage is about 4,200 tons. Their cargo capacity is 10,000 tons.

At the close of the first year of the operation of the canal the Luckenbach Steamship Company was maintaining weekly sailings each way between the two seaboards of the United States. The fleet consisted of 10 steamers owned by the company and 2 operated under charters. The vessels of this fleet average somewhat smaller than the American-Hawaiian fleet, their gross tonnage ranging from about 3,000 to 5,000 tons. The newer vessels of the Luckenbach Line measure about 5,000 tons gross and vessels of this size ordinarily can be loaded with 7,000 or 8,000 tons of freight.

A third line between the two seaboards, the Atlantic and Pacific Line, operated by W. R. Grace and Company, in 1915, dispatched a vessel each way once a month. The fleet included 5 vessels, 4 of which measured 6,309 tons gross and 4,325 tons net each. The fifth vessel is somewhat smaller. The four large vessels were of the same type as the *Santa Clara,* of which a photograph is presented in Figure 4. This company also operates the Merchants' Line between New York and ports on the west coast of South America via the Panama Canal; and, in normal times, there are fort-

FIG. 4. THE *SANTA CLARA* OF THE ATLANTIC AND PACIFIC STEAMSHIP COMPANY.

nightly sailings in this service which are performed by 7 steamers.

In the summer of 1915 the Panama-Pacific Line, one of the companies of the International Mercantile Marine Company, began the operation between New York and San Francisco of the *Kroonland* and *Finland* (Fig. 5), large vessels of over 13,000 tons gross and about 8,500 tons net. These vessels carried passengers and higher classes of freight and made the trip via the canal in 17 to 19 days. The *Korea* and *Siberia,* of 11,284 and 12,760 tons gross respectively, were sold in 1915 by the Pacific Mail Steamship Company to the Atlantic Transport Company eventually to be operated in the coastwise trade in connection with the *Kroonland* and *Finland;* but in 1916, the *Korea* and *Siberia* were sold to the Toyo Kisen Kaisha. With these 4 vessels, the Panama-Pacific Line would have been able to maintain a combined passenger and freight service with sailings at intervals of approximately 10 days. A photograph of the *Kroonland* is presented in Figure 1, the frontispiece.

In addition to the sailings of the four intercoastal lines above described, the services between the two seaboards of the United States in September, 1915, included the dispatch of a vessel each way about once a month by Crowell and Thurlow, and an intermittent service by Sud-

den and Christenson, Swayne and Hoyt, and the Dollar Line. The great demand, which was created by the European War, for neutral vessels in the foreign trade caused the diversion to the foreign service of numerous vessels that have been and would otherwise now be operated through the canal in the American coastwise trade.

The foregoing account of the services of regular lines operated by way of the canal between the two seaboards of the United States should be supplemented by a brief reference to two special types of vessels sometimes operated by ocean transportation companies, but more often by producers who employ their own ships to transport their products. These are the special types of vessels for the transportation of lumber and for the carriage of oil in bulk.

For the transportation of lumber the so-called "steam schooner" was developed on the west coast of the United States. A profile of a typical steam schooner is shown in Figure 6. This vessel is 235 feet in length, of 42½ feet beam, and has a molded depth of 18 feet 8 inches. Its gross tonnage, American registry, is 1,600 tons and its net tonnage only 915 tons. It will be noted that the engine room is well aft and that there is only one deck extending from the engine room to the forecastle. The entire central portion of the vessel, with the exception of one deck, is an open space

FIG. 5. THE *FINLAND* OF THE PANAMA-PACIFIC LINE, INTERNATIONAL MERCANTILE MARINE COMPANY.

for the stowage of lumber. This small vessel can carry 1,500,000 feet of lumber, only about half of which is stowed below the deck; the remainder is carried as deck cargo. Some vessels of this type make use of the Panama Canal, although lumber, even when moved in full vessel cargo lots, is not always transported in vessels of this type. A lumber carrier of different design operated by Crowell and Thurlow, of Boston, is illustrated by Figure 7.

Petroleum oil is a commodity that is handled in large tonnage through the Panama Canal. This is carried, for the most part, in tank vessels operated by the Standard Oil Company and other companies engaged in the oil trade. Most of the oil tankers are equipped with steam engines, but some of them have been provided with an internal combustion oil engine of the Diesel type. Figure 8 presents a profile of an oil tank carrier equipped with the Diesel engine. This type of engine, which does away with the boiler room and which requires but a small quantity of fuel, is becoming popular as technical difficulties in its construction and operation are overcome. As the profile shows, the engine room is in the after part of the ship, as also are most of the living quarters. There is a small cargo hold forward and relatively large water ballast tanks in the peak, and forward hold. The main portion of the vessel is divided

into 14 tanks, 7 on each side of a central longitudinal bulkhead.

The services thus far described have been those over the first of the five main routes above mentioned. An account of the services established via the four other routes during the first year of canal operation may be confined to an enumeration of the principal lines that were in operation in September, 1915.

Over the route via the canal between Europe and the west coast of North America, the Harrison Line maintained monthly sailings between Great Britain and Pacific ports of the United States and Canada, and in connection with the service of the Harrison Line was the Direct Line running vessels to and from Glasgow. The East Asiatic Company dispatched a vessel each fourth week from Scandinavian ports via Genoa and thence to Los Angeles, San Francisco, Portland, Tacoma, Seattle, and Vancouver. Each four weeks a vessel was dispatched in the opposite direction over the same route. The Johnson Line operated one vessel at intervals of 60 days over approximately the same route as that followed by the East Asiatic Company. The Swedish Transatlantic Company also operated a 60-day service over this route. Alfred Holt and Company maintained a monthly service from Great Britain, via Kingston, to west coast ports, from San Francisco

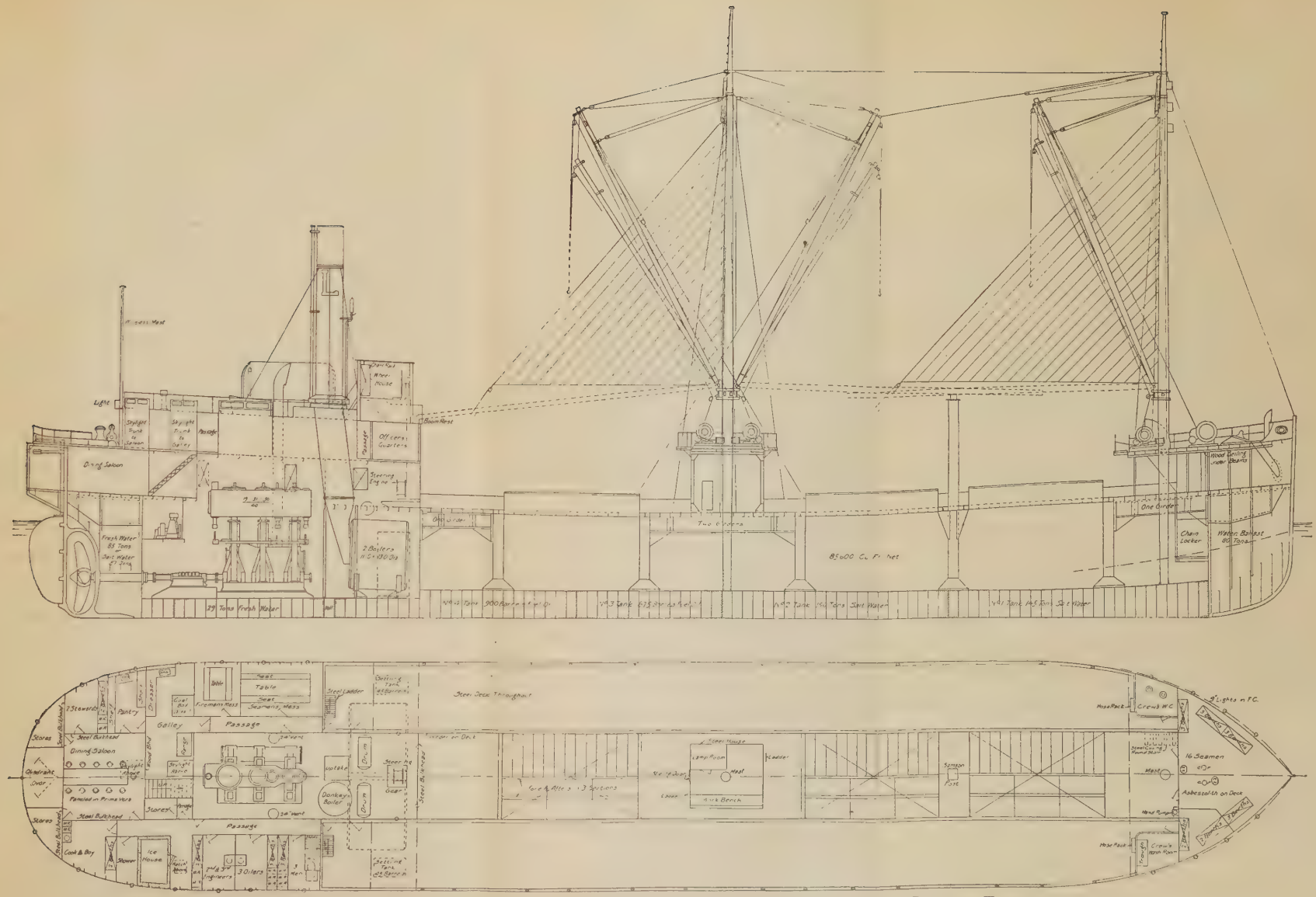

FIG. 6.—PROFILE OF "STEAM SCHOONER" FOR WEST COAST UNITED STATES LUMBER TRADE

to Vancouver inclusive. The Maple Leaf Line dispatched a vessel at intervals of about 6 weeks from New York to Vancouver, thence to San Francisco and from thence to Europe and back to New York.

Over the route between Europe and South America three services were maintained at the close of the first year of canal operation. The East Asiatic Company dispatched vessels fortnightly each way over the route from Scandinavian ports to Genoa and Barcelona, and thence to the west coast ports of South America from Guayaquil to Valparaiso inclusive. The Pacific Steam Navigation Company and the Royal Mail Steam Packet Company maintained fortnightly services from Great Britain, via the West Indies, to the west coast of South America as far as Valparaiso. This service was supplemented by a fortnightly dispatch of vessels operated between the canal and west coast South American ports. The Johnson Line maintained a service on a six-weeks schedule between Scandinavian ports and the west coast of South America.

On the route between the United States and the west coast of South America, three lines were operated, one of them, the Merchants' Line, owned by W. R. Grace and Company, has already been referred to. It had sailings each way between New York and ports of Ecuador, Peru and Chile.

These sailings were on a monthly schedule and in normal times the schedule would be a fortnightly one. The West Coast Line, operated by Wessel, Duval and Company, maintained a service with monthly sailings between New York and the ports on the west coast of South America. The New York and South America Line of the United States Steel Products Company had an approximately fortnightly service over this route.

Between the United States and the Far East, including Japan, China, the Philippines, Australia and New Zealand, several lines were operated through the Panama Canal. The sailings over this route are less regular than over the other routes mentioned, partly because of the fluctuations in the volume of trade, and partly because vessels sometimes use the Suez Canal for the voyage to or from the Orient. The Nippon Yusen Kaisha maintained monthly services between New York and the Orient. The American and Manchurian Line (Ellerman and Bucknall Lines) maintained sailings at intervals of approximately three weeks between New York and Vladivostok. The same line also maintained sailings each three weeks from New York to New Zealand and Australia. Several companies, including the American and Oriental Line, the Barber Line, the Shewan Tomes and Company, and the Indra Line, together maintained a service from New York to Vladivos-

Fig. 7. The *Lewis K. Thurlow*.

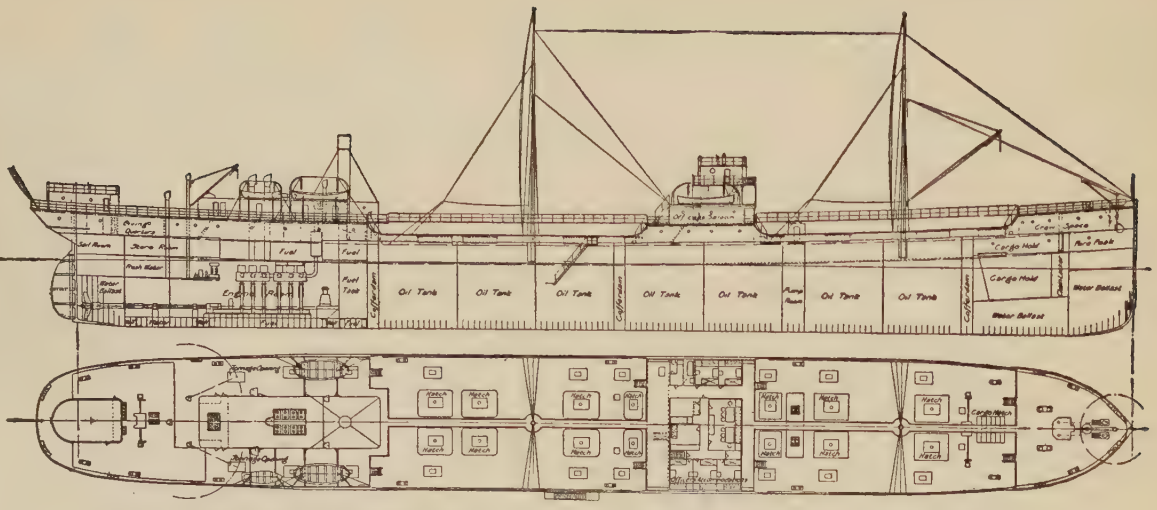

FIG. 8.—PROFILE AND UPPER DECK PLAN OF OIL TANK CARRIER, WITH DIESEL ENGINES

tok with sailings at about ten-day intervals. The Prince Line had sailings about once in five weeks from New York to the Far East, while the United States and Australia Steamship Company dispatched vessels at intervals of six weeks from New York to Australia and New Zealand ports.

The lines operated over the five routes that have been considered do not include the services of several lines whose routes terminate at the canal. Lines having the canal as a terminus carry a considerable volume of traffic that is transferred at the canal. The Panama Rail Road Steamship Line has a weekly service between New York and Cristobal. The Pacific Steam Navigation Company has maintained a fourteen-day schedule between Cristobal and west coast ports as far south as Valparaiso. The South American Steamship Company (Chilean Line) has dispatched vessels each two weeks from the canal to west coast South American ports, while the Peruvian Steamship Company has maintained a two-weeks schedule from the canal to ports of Ecuador and Peru. This company also dispatches vessels northward from the canal to Salina Cruz and intermediate ports on a fortnightly schedule.

The development of services through the canal during the first year of its operation was greatly hampered by the European War. The trade of Europe with countries reached by the canal was

much reduced in volume, and a large share of the world's shipping was made unavailable for commercial uses by the interning and blockading of vessels, the commandeering of ships for military and naval uses, and the actual destruction of a large tonnage of both freight and passenger steamers. It was only the trade between the two seaboards of the United States that was approximately normal; and for that trade the services established via the canal were fully equal to the predictions made before the isthmian route was opened.

The total interruption of traffic for a period of seven months as a result of the Culebra slide of September 18, 1915, coming at a time when the European War had created an abnormal scarcity of shipping, caused many vessels that had been operated through the canal in 1915 to be diverted to other services. It can hardly be expected that all the vessels thus diverted will be restored promptly to their former routes through the Panama Canal. The services through the canal during 1916 can hardly include all the lines and vessels that were in operation in September 1915.

CHAPTER V

THE CANAL AND FREIGHT RATES

The Panama Canal was constructed to lessen the costs of transportation by reducing the time and distances of voyages between the eastern seaboard of the United States and Canada and the west coast of North and South America, between Europe and the Pacific coast of the Americas and between the Atlantic seaboard of North America and Japan, China, the Philippines, Australia, and New Zealand. It was sought to effect this reduction in the costs of transportation in order thereby to facilitate trade, to assist industry to develop, and, if possible, to lower the price which consumers pay for articles.

It is clear that the carrier's costs of transportation can be lowered by shortening the distances that commodities have to be carried; and it is equally evident that trade and industry will be aided if the reduction in the costs of transportation is accompanied by a corresponding decrease in freight rates. If freight charges are lowered, manufacturers and other producers will be benefited and it will be possible for them to lower

wholesale prices. The extent to which wholesale prices will actually be reduced by a lowering of the costs of transportation and a decrease in freight rates will, of course, depend upon the extent to which wholesale prices in the various industries are subject to competition and the extent to which they are monopolistic. In international trade, wholesale prices are, in most instances, controlled by competition; but in domestic or internal trade, wholesale prices in many industries are only partially determined by competition. Some products are sold in the domestic market at wholesale prices that are fully competitive, the prices of other articles are controlled in part by competition and in part by monopoly, while some commodities are sold at such wholesale prices as producers may think best to charge; i. e., wholesale prices may be competitive, partially monopolistic, or completely monopolistic.

When wholesale prices are controlled by competition, a reduction in the producer's cost which includes freight charges will result in lower prices to wholesale buyers. Inasmuch as only a part of the many articles which enter into domestic trade are produced and sold under conditions of unrestricted competition, it must be evident that it would be difficult to determine the influence which a reduction in general freight rates, due to the Panama Canal, will have upon the general

level even of wholesale prices. It must also be evident that it would be more difficult to determine the effect which the Panama Canal may have upon retail prices. The factors which enter into the determination of retail prices are so many and so difficult to measure that one may well conclude that it is practically useless to endeavor to estimate the benefits which individual consumers will derive from the transportation economies resulting from the use of the Panama Canal.

In view of these facts, the present discussion of canal freight rates will be limited to a consideration of the general effects of the canal; first, upon the cost of transportation, particularly between the two seaboards of the United States; and, second, the effects which the reduction in the costs of transportation may be expected to have, or actually has had, upon the rates charged by American railroads that compete with the coastwise lines for traffic between the eastern and western parts of the country. This discussion will, necessarily include an analysis of the factors that control railway rates between the Atlantic and Pacific sections of the United States, and an explanation of the adjustment of rates that the interested railroads have actually made in order to meet the competition of the coastwise carriers.

The general effect of the Panama Canal upon the cost of transportation will be, first of all, that

due to reducing the length of ocean routes and the time vessels take in performing the transportation services for which charges must be paid by shippers and consignees. A statement has been made in Chapter III of the reduction which the canal will effect in the length and time of ocean voyages. The reduction in the cost of transportation between terminals is roughly proportionate to the reduction in the length and time of voyages.

Another measurable effect of the canal upon the cost of transportation is the economy due to the avoidance of the transfer of such traffic as was, or would be, transferred across the Isthmus at Panama or Tehuantepec. Since 1855 traffic has been regularly transferred across the Isthmus of Panama, and, during the seven years preceding the opening of the Panama Canal, an increasing tonnage of freight was shipped between the two seaboards of the United States, and from Hawaii to New York, via the Isthmus of Tehuantepec. The transfer costs at the Isthmus, including the double handling of traffic, the maintenance of expensive terminals, and the operation of a railroad across the Isthmus, amount, on the average, to more than $3 per ton of 2,000 lbs. For several years the American-Hawaiian Steamship Company paid the Mexican National Railway at Tehuantepec an average of about $3.50 per ton for

transferring traffic from the vessel in one ocean to the ship in the other ocean.

It need hardly be said that the actual cost of transferring traffic from vessel to vessel is not the full measure of expenses avoided by the opening of the canal across the Isthmus. The transfer of traffic delays vessels and thus reduces the earning capacity of ships, and any delay such as the double handling of traffic increases the time required to transport goods from shipper to consignee. Throughout the business world time is money, and a reduction in the time required for the transportation of freight means a definite saving for the producer and trader as well as for the carrier.

The Panama Canal has reduced the cost of transportation by providing an additional facility that can advantageously be used by a large share of the world's commerce. The addition of such a facility as the Panama Canal to the agencies that serve ocean commerce makes it possible and profitable to add to the number of ocean lines, to enlarge terminal facilities, and thus generally to increase the facilities that serve ocean commerce and reduce the expense of trading in markets reached by ocean routes. Some of these economies are expressed in reduced freight rates, while others not less definite are expressed not in lower freight charges but in the larger commerce that becomes

possible by the shifting of lines of ocean commerce from circuitous to more direct routes.

The effect which the canal has had upon the system of rates by rail between the eastern and western sections of the United States can be stated only by beginning with a brief account of the rates that, before the opening of the canal, had been worked out by the transcontinental railways in competition with the carriers that were engaged in the intercoastal commerce.

The first railroad constructed from the Missouri River to the Pacific coast was the Union Pacific-Central Pacific line that was opened in 1869. Fourteen years before this a railroad had been completed across the Isthmus of Panama from Colon to Panama, and traffic via the Panama route between New York and San Francisco was carried in large volume up to the opening of the transcontinental railroads across the United States. From 1870 on, the tonnage transferred across the Isthmus of Panama en route between the Atlantic and Pacific seaboards of the United States decreased, but the use of this route was never abandoned; and, during the ten years preceding the opening of the Panama Canal, an enlarged volume of through business was handled by the Panama Rail Road. Throughout the latter half of the nineteenth century, sailing vessels made their way between the two seaboards of the United States

around Cape Horn, while steamers took the route through the Straits of Magellan. Thus from the beginning, the transcontinental railroads had to meet the competition of the coastwise carriers, and this competition was especially active from 1907 to the opening of the canal, during which period the American-Hawaiian Steamship Company made use of the route via the Isthmus of Tehuantepec across which traffic was transferred by the Mexican National Railway.

The competition of the transcontinental railways with the coastwise carriers resulted in the adoption of a system of transcontinental rates having the following special characteristics:[1]

(a) The through rates between the two seaboards are lower than the charges for the shorter haul to and from intermediate points in the Rocky Mountain States. The rates from New York or Pittsburgh to points in Nevada or Utah are higher than the rates to California; likewise, rates from Nevada, Utah or Idaho to the eastern part of the United States are usually in excess of charges from points at or near the seaboard in California, Oregon and Washington.

(b) The westbound rates to the intermediate points, until recently, have usually been the sum of the through rate plus the local rate from the nearest Pacific coast

[1] See "Commercial and Trade Aspects of the Panama Canal," a paper which the writer prepared for the International Engineering Congress that met in San Francisco, September 20-25, 1915.

terminal to the intermediate point of destination; i. e., the rate from Philadelphia to Reno, Nevada, has formerly been the rate to Sacramento, the nearest Pacific coast "terminal," plus the local rate from that terminal to Reno. Some intermediate rates, particularly the rates to intermountain points on the northern transcontinental lines, have been the sum of the rates to or from the Pacific coast terminal plus a differential somewhat less than the local rate between the seaboard terminal and the intermediate point.

After a long contest carried on by the shippers in the intermountain territory against these higher rates at intermediate points, the Interstate Commerce Commission, in 1911,[1] established a percentage adjustment between the through and intermediate rates on westbound shipments. The decisions of the Interstate Commerce Commission in the Reno and Spokane cases, which were later upheld by the Supreme Court,[2] provided that on traffic originating at the Missouri River and points west thereof (Zone 1) the rates to intermediate points should not be higher than the rates through to the Pacific coast terminals; that on traffic originating in the Chicago territory and at points between Chicago and the Missouri River (Zone 2), the rates to intermountain points should not exceed by more than 7 per cent. the through rates to the coast; that, on shipments originating in the Buffalo-Pittsburgh territory, and in the section between that territory and Chicago (Zone 3), the rates to inter-

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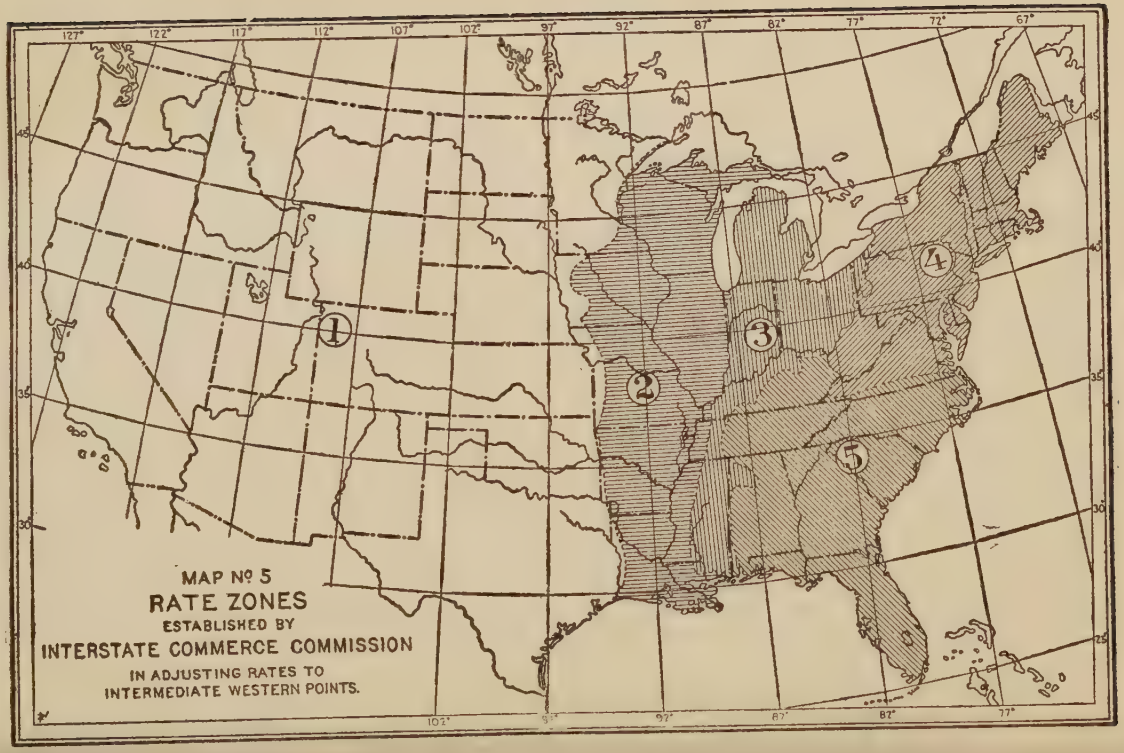
[1] *Railroad Commission of Nevada* v. *Southern Pacific Co., et al.*, XXI I. C. C. Reps., 329-84; *City of Spokane et al.* v. *Northern Pacific Co. et al., Ibid.*, 400-27.

[2] Intermountain Rate Cases, 234 U. S. 476. Decided June 22, 1914.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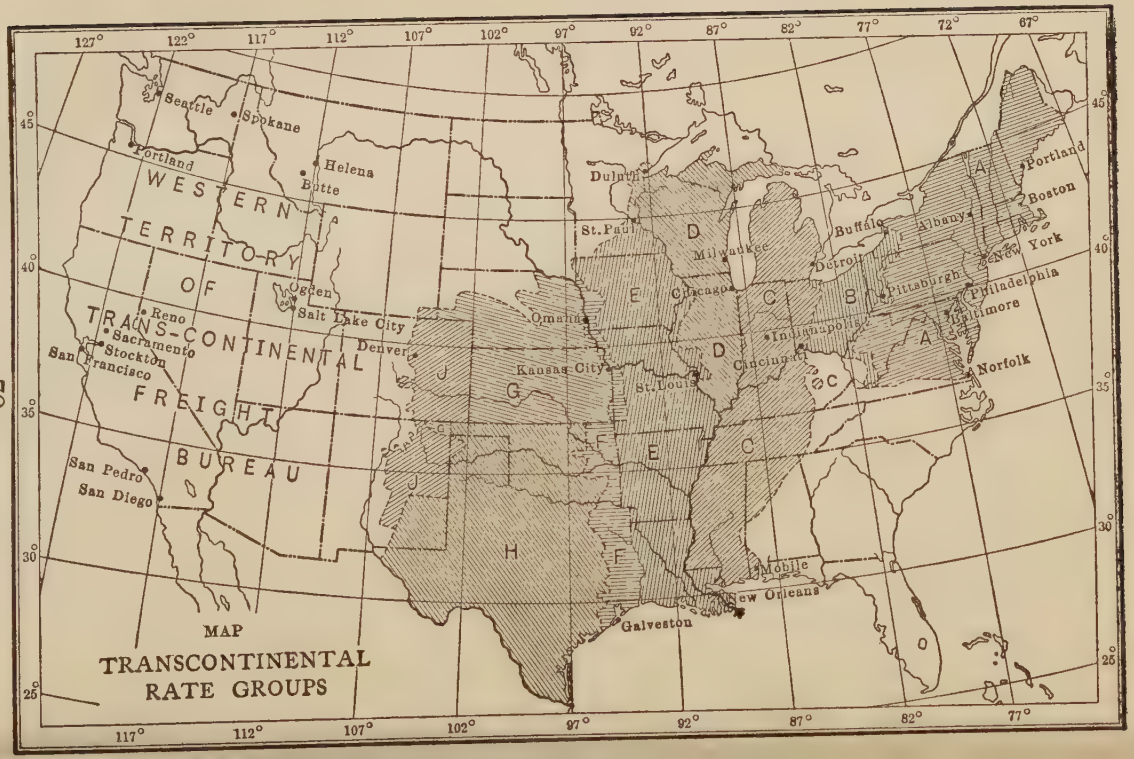
MAP Nº 5
RATE ZONES
ESTABLISHED BY
INTERSTATE COMMERCE COMMISSION
IN ADJUSTING RATES TO
INTERMEDIATE WESTERN POINTS.

mountain points should not exceed the through rates by more than 15 per cent.; and that, on traffic from the section between the Buffalo-Pittsburgh district and the Atlantic seaboard (Zone 4), the rates to intermountain points should not exceed the rates through to the Pacific seaboard terminals by more than 25 per cent. These percentages indicate the commission's estimate of the influence of the Panama and Tehuantepec routes upon the transcontinental railroad rates before the opening of the Panama Canal. The transcontinental rates to and from the southeastern part of the United States (Zone 5) were not included in the percentage adjustment. The five zones are charted on Map 5.

(c) Another effect of the competition of the coastwise lines with the transcontinental railroads was the blanketing of westbound rates over the eastern half of the United States. The rates to the west coast on most commodities were the same from all points east of the Missouri River; i. e., the same rate prevailed from New York, Chicago, St. Louis and Kansas City to west coast points.

Both class rates and commodity rates westbound as well as eastbound are stated by lettered "rate groups" A to J, into which the eastern half of the United States is divided. Map 6 shows the area covered by the several rate groups. In the case of class rates, there is some grading of charges by rate groups on westbound traffic, and to a greater extent upon eastbound freight. However, most commodities shipped from the eastern half of the United States to the west coast pay the same rate


127° 122° 117° 112° 107° 102° 97° 92° 87° 82° 77° 72° 67°
45° 40° 35° 30° 25°
Seattle
Spokane
Portland
Helena
Butte
WESTERN TERRITORY OF TRANS-CONTINENTAL FREIGHT BUREAU
Ogden
Salt Lake City
Reno
Sacramento
Stockton
San Francisco
Denver
San Pedro
San Diego
Duluth
St. Paul
Minneapolis
Omaha
Kansas City
St. Louis
Chicago
Milwaukee
Detroit
Buffalo
Albany
Portland
Boston
New York
Philadelphia
Baltimore
Norfolk
Pittsburgh
Cincinnati
Indianapolis
Mobile
New Orleans
Galveston
A
B
C
D
E
F
G
H
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MAP
TRANSCONTINENTAL
RATE GROUPS

whether shipped from the Atlantic seaboard section or from the central West.[1]

The through route between the two seaboards via the Southern Pacific Railroad from the Pacific coast to Galveston and New Orleans and from those cities to New York by the Southern Pacific Company's steamers (the Morgan Line) was established in 1883. The Sunset-Gulf route immediately began an active warfare against its competitors by rail and by water lines, and secured a large share of the traffic from coast to coast. The transcontinental railroads, other than the Southern Pacific, ran from the Mississippi and Missouri rivers to the Pacific coast and were primarily interested in the development of traffic between the middle West and the Pacific coast. The rates by the Sunset-Gulf route from New York to San Francisco were made the same as the rates by the transcontinental lines from St. Louis and Missouri River crossings to the Pacific. Gradually the rates by the through all-rail lines from the Atlantic to the Pacific were made the same as the rates from Chicago, St. Louis and Missouri River crossings to the Pacific seaboard. This system of blanket rates was worked out by 1896, and has since prevailed on westbound traffic.[2]

[1] For a full explanation of transcontinental freight rates see Johnson and Huebner, *Railroad Traffic and Rates*, I. chap. xxiv (1911).

[2] See Johnson, *Panama Canal Traffic and Tolls*, 52.

This policy of the Southern Pacific had much to do in bringing about the blanketing of westbound transcontinental rates. The other cause that brought about this system of blanketing rates was the insistence of manufacturers in Chicago, St. Louis, St. Paul and other central western points, as well as the demand of the railroads connecting the Mississippi Valley with the Pacific coast, that the middle West should be allowed to market its products on the west coast in even competition with manufacturers located at or near the Atlantic seaboard whose rates by rail to the Pacific coast were regulated by competition between the coastwise and rail lines.

Eastbound rates from west coast points to places on and east of the Missouri River were, in part, blanketed over the territory east of the Missouri River, but the system of blanketing the territory east of the Missouri River did not prevail so fully in eastbound as in westbound tariffs. Eastbound rates were, and still are, graded by zones, or by so-called "rate groups," as explained above, but in the case of fruit, lumber and other important commodities there is little grading of rates as between different parts of the territory east of the Missouri River.

Such was the system of transcontinental railroad rates at the time of the opening of the canal. Shortly before the canal route became available,

the Supreme Court had, as stated above, upheld the decisions of the Interstate Commerce Commission in the Intermountain Rate cases and the commission had issued an order establishing the percentage adjustment above described between the through rates to the west coast and the rates to intermediate intermountain points. Had that system of percentage adjustments remained unchanged, whatever effect the canal may have had upon through rates by rail between the two seaboards it would have had upon the rates to intermediate intermountain points which would have changed automatically with variations in the through rates. The Pacific railroads, supported by certain business interests in the middle West, were, however, desirous of securing authority to reduce rates by rail from the middle West to the Pacific coast without being obliged thereby to lower the charges to intermediate places in the Rocky Mountain territory; and the Interstate Commerce Commission was petitioned to permit the reduction of some through rates without making a change in the intermediate charges. In other words, the Interstate Commerce Commission was petitioned to modify its decisions in the Spokane and Reno cases; and, after hearings held in October, 1914, the Interstate Commerce Commission, in an opinion rendered January 29, 1915, permitted the railroads under certain limi-

tations to reduce the westbound through rates without lowering the charges to intermediate points on a list of articles including commodities for which the competition of rail and water lines is most active.[1] This order was, however, rescinded by an order effective September 1, 1916. See note page 93.

This decision of the Interstate Commerce Commission permitting the railroads to make lower rates through to the Pacific seaboard without reducing charges to intermediate intermountain points was reached after comparing rates by the transcontinental railroads and by the coastwise carriers upon the principal commodities moved between the two seaboards. The commission found that the traffic by way of the canal comprised articles originating in the middle West as well as articles shipped by producers at the seaboard. Concerning the extent of the actual competition of the coastwise carriers with the railroads, the commission says:

Whatever may have been the degree of competition in the past between the rail carriers and the water carriers as to the rates on these articles concerning which additional relief is now sought, we are witnessing the beginning of a new era in transportation between the Atlantic

[1] Commodity Rates to Pacific Coast Terminals and Intermediate Points, XXXII I. C. C. Reps., 611-58; *Ibid.*, XXXIV, 13-20. See note at end of chapter concerning rescinding of these orders.

and Pacific coasts. To secure any considerable percentage of this coast-to-coast traffic, rates on many commodities must be established by the rail lines materially lower than those now existing.

The Interstate Commerce Commission took the position that the railroads should be allowed to compete actively with the coastwise carriers, and that the railroads should be permitted so to adjust their through and intermediate rates as to make competition with the coastwise lines possible on a large scale. The view of the commission concerning the policy that should be followed by the Government in regulating the rates upon the traffic which the railroads secure by competition with the coastwise lines was expressed as follows:

It has been suggested that the construction of the Panama Canal by the Government of the United States is indicative of a governmental policy to secure all of this coast-to-coast business for the water lines, and that no adjustment of rates by the rail lines should be permitted which will take away traffic from the ocean carriers which normally might be carried by them. This suggestion, however, loses force under the consideration that the Panama Canal is but one of the agencies of transportation that the Government of the United States has fostered between the Atlantic coast and the Pacific. The Government has from the beginning of railroad construction in the United States encouraged their construction and operation by private capital and enterprise. Some of these transcontinental lines would not

have been built had it not been for the liberality of the Government extended to them at the time of their construction. As we view it, the Panama Canal is to be one of the agencies of transportation between the east and the west, but not necessarily the sole carrier of the coast-to-coast business. If the railroads are able to make such rates from the Atlantic seaboard to the Pacific coast as will hold to their lines some portion of this traffic with profit to themselves, they should be permitted so to do. The acceptance of this traffic will add something to their net revenues, and to that extent decrease, and not increase, the burden that must be borne by other traffic. It will also give the shippers at the coast points the benefits of an additional and a competitive service.

The adjustment of rates authorized by the Interstate Commerce Commission to give effect to the policy expressed in the paragraph just quoted allowed a modification, but not the abandonment, of the percentage relationship between the through rates by rail to and from the coast and the rail rates to intermountain points. The commodities transported by the transcontinental railroads were grouped by the commission into schedules A, B, and C, and the rates in schedules A and B were left as they were before the opening of the canal. The commodities, somewhat more than 100 in number, included in schedule C were given reduced rates through to the coast, but the reduced rates were to bear a fixed differential relation to the rates on the same com-

modities to intermountain points. The rate adjustment allowed January 29, 1915, was as follows:[1]

From points on the Missouri River and in the territory west thereof (Zone 1) carload rates to intermediate points are not to exceed those to Pacific coast terminals, except for a list of 28 articles or commodity groups which consist, for the most part, of various kinds of iron and steel manufactures. In the case of this excepted list the through rates, as filed by the carriers, may be less than the intermediate rates, provided that the rates to intermediate points in no instance exceed 75 cents per 100 pounds.

Carload rates through to the Pacific coast seaboard from Zones 2, 3 and 4 may be lower than the intermediate rates for articles listed in schedule C (with the exception of six exempted commodities and of 27 items that were withdrawn by the carriers from their petition), provided the rates to intermediate intermountain points from points in Zones 2, 3 and 4 do not exceed the rates from the Missouri River to the same destinations by more than 15, 25 and 35 cents per 100 pounds, respectively. In the case of coal and pig iron, the rates to the Pacific coast may be lower than the rates to intermediate points, provided the intermediate rates do not exceed 5 mills per ton per mile.

For commodities in schedule C the through rates on less than carload shipments from points in Zone 1 may be lower than the rates to intermediate points on "all articles listed as first or second class in western classification upon which the rates to the terminals are less than $1.50 per 100 pounds, and on all articles listed as

[1] This adjustment has been rescinded, effective September 1, 1916.

third or lower class on which the rates to the terminals are less than $1.25 per 100 pounds, provided that on and after May 1, 1915, the rates to intermediate points on all such first and second class articles do not exceed $1.50 per 100 pounds, and on all such third or lower class articles $1.25 per 100 pounds. By the supplemental decision of April 30, 1915, the maximum less-than-carload rates to intermediate points on first and second classes may be $1.72 per 100 pounds when lower rates to the terminals are applicable.

Less-than-carload commodity rates from points in Zones 2, 3 and 4 to Pacific coast terminals, as filed by the carriers, may be lower than the rates to intermediate points, provided "the rates to intermediate points do not exceed the rates from the Missouri River to the same destinations by more than 25, 40 and 55 cents per 100 pounds from points in Zones 2, 3 and 4, respectively.

The decision of the Interstate Commerce Commission by which the foregoing adjustment of rates was permitted was supplemented by a second decision rendered a few months later, April 30, 1915,[1] defining the "back haul" territory inland from the Pacific coast terminals, and fixing the rates which the railroads might charge for traffic to points in that territory. The back haul territory was made to extend 200 miles inland from the Pacific coast, and the direct rail rate into this territory is not to exceed the sum of the through rate to the Pacific coast plus 75 per

[1] XXXIV I. C. C. Reps., 13-20.

cent. of the local rate from the nearest coast terminal to the inland point of destination within the back haul territory. It is provided, moreover, that the sum of the through rate to the Pacific coast plus 75 per cent. of the local back haul rate shall not exceed the maximum prescribed for intermediate points in the rate adjustment permitted by the previous decision of the commission, that of January 29, 1915. The Pacific coast ports included by the Interstate Commerce Commission in the list of cities to which terminal rates are allowed, and from which back haul rates may be calculated to determine the charge by direct rail route to points in the back haul territory, are San Diego, San Pedro, East San Pedro, Wilmington, East Wilmington, San Francisco, and Oakland, Cal.; Astoria and Portland, Ore.; Vancouver, Bellingham, South Bellingham, Everett, Tacoma, Seattle, Aberdeen, Hoquiam, and Cosmopolis, Wash.[1]

Another important adjustment in transcontinental railroad rates was made after the Interstate

[1] The railroads had previously treated as terminals a much larger number of cities. The cities of Sacramento, San José, Stockton, and Santa Clara have secured an order from the United States District Court forbidding the Interstate Commerce Commission from denying these four cities terminal rates. Presumably the commission will appeal to the United States Supreme Court for a reversal of the District Court's order.

Commerce Commission's order of April 30, 1915, was issued. By that order the rate on certain specified iron and steel articles to Pacific coast ports from Chicago and from all points between Chicago and the Missouri River was 55 cents per 100 pounds, whereas the rate from Cincinnati (group C) territory and from Pittsburgh (group B) territory was higher, the rate from Pittsburgh and common points being 73.9 cents per 100 pounds. The railroads, supported by Cincinnati and Pittsburgh shippers, petitioned for a 55-cent rate on specified iron and steel articles from Pittsburgh in order that Pittsburgh and Cincinnati might be put upon a common basis with Chicago in shipping to the west coast, and also that the railroads might be able to hold the traffic from Pittsburgh and Cincinnati against the competition of the coastwise carriers through the canal.

The commission granted a 65-cent rate from Pittsburgh and Cincinnati (rate groups B and C). This decision was rendered March 1, 1916.[1] At that time the Panama Canal was not open to traffic and coastwise carriers were not quoting rates between the two seaboards, but shortly before the canal was closed in September, 1915, coastwise rates on many articles of steel were 40

[1] "Rates on Iron and Steel Articles from Pittsburgh Territory to Pacific Coast Ports," XXXVIII I. C. C. Reps., 237-242. This decision and order were rescinded September 1, 1916.

cents per 100 pounds. In some instances the rates were 45 and 50 cents. It was the judgment of the commission that an average coastwise rate of 40 cents on iron and steel between the two seaboards justified a rate of 65 cents by all-rail route from Pittsburgh and Cincinnati to the west coast.

The rate policy followed by the coastwise lines that have been operated through the canal has been modified from time to time and probably has not yet reached its final formulation.[1] As was to have been expected, several coastwise lines began operating between the two seaboards of the United States as soon as the canal was opened; and in order to secure adequate traffic promptly, especially low rates were offered shippers. The principal coastwise lines readily secured at these low rates all the traffic they were able to handle, and from time to time advances were made in the rates.

A comparison of the rates between the two seaboards that were charged, in 1914-15, by the coast-

[1] April 25-27, 1916, the Interstate Commerce Commission heard testimony and argument upon a petition of the intermountain cities for a readjustment of the relation of the through and intermediate rates. The basis of the petition was the lessened competition of the coastwise carriers with the transcontinental railroad lines due to the temporary closing of the canal and to the effect of the European War upon ocean rates. This petition was granted by order effective September 1, 1916.

wise lines and by the railroads shows that the rates coastwise were lower than the railroad rates by amounts varying largely with different commodities. The rates of the coastwise lines cover only the transportation between the seaboard terminals, whereas the railroad lines quote a flat or blanket rate applying not only between the seaboard terminals but also, as regards many commodities, from points in all rate groups A to J to Pacific coast terminals. (See Map 6.) That is, the railroad rate between Pittsburgh or Chicago and the Pacific coast is, for many articles, the same as the rail rate between New York and the Pacific coast, whereas the transportation charges for shipment between Pittsburgh and the Pacific coast via New York would include the rate charged by the coastwise lines and also the rail rate from Pittsburgh to New York. It is no longer the practice of coastwise lines to "absorb" the rail portion of such a rate, and the shipper to or from an interior point like Pittsburgh or Cincinnati must figure out for each commodity whether it would be more economical to ship by the direct all-rail route, or by an indirect rail and coastwise route. In general, it has been the policy of the coastwise carriers so to adjust their rates as to be able to compete successfully for such shipments to and from interior points as were deemed by the managers of the coastwise

lines to be necessary to enable the lines to secure the tonnage required to fill their vessels.

A comparison of the rates that have been charged by the principal lines operating coastwise through the canal between the two seaboards of the United States shows for most commodities that the rates have been the same by all of the lines. There are, however, some differences in the rates that have been charged by the different lines, and the rates up to the present time have evidently not been fixed by agreements among the competing carriers. Traffic has been so abundant and the demand for ocean shipping created by the European War has been so great that the coastwise lines have not been obliged to take measures to limit competition. It is not to be expected, however, that these conditions will prevail permanently after the close of the war and the return of normal commercial conditions. In course of time the coastwise lines operating through the canal may be expected to associate in "conferences" for the purpose of agreeing upon uniform rates and adjusting the charges coastwise with reference to the charges of the transcontinental railroads.

The rate policy which the transcontinental railroads will follow and the system of charges which they will maintain have now been determined by the Interstate Commerce Commission, subject,

possibly to minor future changes from time to time. The general schedule of rates charged by transcontinental railroads will, as the result of government regulation, necessarily be stable; and, in the long run, the coastwise carriers, while exerting a constant competitive influence upon the general system of transcontinental railroad rates, will tend to adjust the rates coastwise with reference to the general level of railroad rates; that is, the charges made by coastwise lines will, in general, be made as much lower than the railroad rates as is necessary to secure for the carriers by water the tonnage required to fill the vessels in operation.

The railroad rates upon such commodities as can be carried coastwise as full vessel cargoes will, necessarily, be influenced by the cost which large producers or shippers of grain, lumber, and similar commodities would incur in securing vessels by purchase or charter for the transportation of cargoes. The number of commodities that can be shipped in full vessel cargoes is limited. Relatively only a few of the largest shippers can profitably own or charter vessels for the transportation of their own commodities. In the long run, the railroads will not be able to make rates as low as the cost of moving commodities in full vessel loads when ships can be purchased or chartered at normal prices or rates. The competi-

tion of the railroads will, for the most part, be with the regular coastwise lines which, however, will probably serve 99 out of every 100 men who ship coastwise between the two seaboards of the United States.

The canal has lowered the cost of transportation by water between the two seaboards of the United States and temporarily caused a reduction of some railroad rates across the United States and consequently a reduction in some of the through rates by rail and water between the United States and foreign countries. If public opinion and wise legislation can effectively control the forces that interfere with the equitable social distribution of the benefits resulting from the reduction which the canal will effect in the cost of supplying consumers with many of the commodities they purchase, the general public, as well as the carriers, traders, and producers who make direct use of the canal, will profit from the investment of $400,000,000 which the United States has made to provide a more economical route for the commerce of the United States and other countries.

[NOTE. As noted at several points in this chapter, the Interstate Commerce Commission, by order effective September 1, 1916, has rescinded its orders of 1915 and 1916 permitting the reduction of through rates to the west coast without corresponding reduction to intermountain points. On account of the European War, ships are so scarce and ocean rates are so high that, for the present, coastwise lines through the canal can not charge rates low enough to control the rates by rail.]

CHAPTER VI

THE CANAL AND THE DOMESTIC TRADE AND INDUSTRIES OF THE UNITED STATES

When, on the fifteenth of August 1914, vessels of commerce began making their way between the Atlantic and Pacific oceans regularly by way of the Panama Canal, an event occurred in the history of the world's commerce comparable only with the opening of the Suez Canal. Following the construction of the Suez waterway, which was completed forty-five years before the Panama Canal was opened, the commercial and economic, and even the political, life of India and eastern Asia entered upon a new development. The East and the West were brought into more intimate intercourse and the progress of both was quickened. The forces set in operation by the Suez Canal have not only continued to shape the course of history but are today more potent than they were when the shortened ocean highway to and from the Orient was first followed by the world's commerce.

It is not yet possible to take full account of the economic changes that the Panama Canal will

produce. We are too near events to see them in perspective. Certain statistics of traffic can be recited, the use being made of the canal by some typical industries can be pointed out, and some forecast may be ventured as to the probable services which the canal will render to the United States and other countries; but only the unfolding scroll of history can reveal the effects which the Panama Canal will have upon the economic and political future of the United States and of other countries bordering the Atlantic and Pacific. For the present it will be well to confine our efforts mainly to a statement of the use that has been made of the canal, and of the clearly discernible influences which the canal may be expected to exert in the years that lie in the immediate future.

To carry out this purpose of making a reconnoissance of the results, accomplished and in early prospect, of the opening, in 1914, of a shorter and more economical route for the intercoastal and foreign commerce of the United States and for the trade of Europe with the Pacific ports of North and South America, it is desirable that this book upon the canal and commerce should devote successive chapters to the relations of the canal to the following subjects: the domestic trade and industries of the United States, the foreign trade of the United States,

the American merchant marine, and the interest of Europe in the canal. This series of chapters may well begin with an analysis of the use made of the canal not only by the domestic commerce and industries of the United States, but also by the commerce of the United States with foreign countries and by the commerce of Europe with countries other than the United States.

The use that is to be made of the Panama Canal by traders and producers making shipments between the eastern and western sections of the United States is indicated by the intercoastal traffic that was carried through the canal up to the time the waterway was temporarily closed by the slides at Culebra in September 1915. During this period of thirteen months, the total shipments via the canal between the two seaboards of the United States (the Hawaiian trade being included) amounted to 2,236,502 tons of cargo, the traffic being nearly equally divided between eastbound and westbound shipments. The net tonnage (Panama Canal measurement) of the vessels that carried this cargo was 1,616,759 tons, the tonnage of a vessel being counted on each trip through the canal. The intercoastal traffic was one-third of the total of 6,706,915 tons of cargo shipped through the canal.

During this period of thirteen months and two days that the canal was in operation before the

slides in September 1915, put the waterway temporarily out of service, the traffic had averaged somewhat over 500,000 cargo tons per month. During the last six full calendar months of the period the average was over 600,000 cargo tons per month. As just stated, one-third of this was strictly domestic commerce that moved between the two seaboards of the United States. The major share of the remaining two-thirds consisted of commerce between the United States and foreign countries. The commerce of the Pacific coast of the United States and Canada with Europe amounted to 969,993 cargo tons, and of this total Canada's portion would be a minor share. The trade between Atlantic-Gulf ports of the United States and western Central and South America comprised 1,363,102 cargo tons, by far the greater part of this being trade with western South America. The commerce via the canal between the eastern part of the United States and transpacific countries, Japan, China, the Philippines and Australia, amounted to 1,195,665 cargo tons. Most of the remaining traffic through the canal during the first thirteen months was that of commerce between Europe and South and Central America. In addition to the traffic definitely assignable to the foregoing categories were 59,525 cargo tons of goods transshipped at Cristobal during July, August, and September, 1915.

There were also 167,968 tons shipped through the canal over "miscellaneous" routings.

Stated in percentages, 33 1/3 per cent. of the traffic via the canal during the first thirteen months of operation consisted of goods shipped in the intercoastal domestic commerce of the United States; 38 per cent. consisted of goods moved in the trade of the United States with foreign countries, i.e., with western Central and South America and with transpacific countries; 10.6 per cent. of commodities in the commerce of Europe with the west coast of Central and South America; about 14½ per cent. of commerce between Europe and the western United States and Canada; while 2½ per cent. was of commerce moving over "miscellaneous" routes.[1]

For purposes of comparison, the traffic through the canal from the Atlantic to the Pacific and from the Pacific to the Atlantic during the first thirteen months of the operation of the canal, over each of the routes above considered, is stated in Table 1:

[1] There were also 59,525 tons of cargo transshipped during July, August and September 1915, at Cristobal while en route between Atlantic and Pacific ports. The official analysis of canal traffic up to the end of June 1915, apportioned the traffic transshipped at Cristobal among the several main routes according to the destination of the traffic transshipped; but the statistics for the months of July, August, and September 1915, do not thus apportion the traffic transshipped at Cristobal.

TABLE 1

Distribution of Traffic over the Five Main Routes, August 1914 to September 1915, Inclusive

Atlantic to Pacific

	Vessels	Net Tonnage	Tons of Cargo
United States coastwise	215	848,428	1,134,673
Europe to west coast of North America	45	158,864	127,376
Europe to South and Central America	58	146,714	81,182
United States to South and Central America	105	342,776	399,776
United States to Australia and Far East	154	641,144	994,370
Atlantic terminus to South and Central America[1]	28	46,161	28,828
Miscellaneous	23	74,661	106,802
Vessels in ballast	133	378,253	.....
Total	761	2,637,001	2,873,007

Pacific to Atlantic

United States coastwise	199	768,331	1,101,829
West coast of North America to Europe	131	493,577	842,617
South and Central America to Europe	133	410,838	632,978
South and Central America to United States	184	632,603	963,326
Australia and Far East to United States	32	138,038	201,295
South and Central America to Atlantic terminus[1]	27	44,316	30,697
Miscellaneous	16	40,457	61,166
Vessels in ballast	36	95,664	.....
Total	758	2,623,824	3,833,908
Total westbound and eastbound	1,519	5,260,825	6,706,915

[1] July, August and September; statistics for previous period apportioned among the several main routes according to destination of the traffic transshipped.

It will be noted that vessels engaged in the intercoastal domestic trade made 414 passages through the canal during these thirteen months. As stated above, these vessels carried 2,236,502 tons of cargo. As measured by the Panama Canal tonnage rules, the total net tonnage of these vessels was 1,616,759, the average size of the vessels being 3,905 tons.

The vessels engaged in the commerce between Europe and the west coast of the United States and Canada, eastbound and westbound, made 176 passages through the canal and transported 969,993 tons of cargo; the number of passages made by these vessels was 11½ per cent. of the total number of vessels through the canal. The tonnage of this cargo constituted 14.5 per cent. of the total cargo traffic of the canal during the period in question.

The commerce of Europe with South and Central America was but a small fraction of what it would have been had there been no war in Europe. Under the conditions of restricted trade, the vessel passages through the canal in this trade during the thirteen months covered by the above table were 191, and the cargo transported amounted to 714,160 tons. Accordingly, this trade amounted to only 12½ per cent. of the total vessel passages through the canal, and to only 11½ per cent. of the total cargo tonnage of the canal. Had there been no war in Europe, it is probable that the traffic between Europe and the west coast of South America would have comprised about 35 per cent. of the total traffic through the canal.

To handle the commerce between the United States and South America during the thirteen months ending with the 17th of September, 1915,

there were 289 vessel passages through the Panama Canal, the vessels being loaded with 1,363,102 tons of cargo. These figures represent 19 per cent. of the total number of vessel passages and 20.3 per cent. of the total cargo tonnage of the canal traffic. Ordinarily the commerce of Europe with the west coast of South America would probably not be less than three times the commerce between the United States and that section, whereas, on account of the war, the trade of the United States was nearly double that of Europe with western South America.

The above table shows that in the commerce between the United States and transpacific countries vessels made 186 passages through the canal, transporting 1,195,665 tons of cargo. These figures represent respectively 12.2 per cent. of the total number of vessel passages and 17.8 per cent. of the total cargo tonnage through the canal. The far-reaching effect of the European War is indicated by these figures concerning the trade of the United States with transpacific countries. In spite of the large shipments of war supplies to Vladivostok for transportation thence to Russia over the Trans-Siberian Railway, the volume of trade between the United States and countries beyond the Pacific was not as large as it probably would have been under normal conditions. The purchasing power of Japan, China, and Australia

was reduced by the European War and, to some extent, by Japan's participation in that war. Moreover, this trade, like that of other parts of the world, was restricted by the scarcity of vessels and the high freight rates prevailing on the ocean.

The traffic transshipped from one vessel to another at Cristobal, the Atlantic terminus of the canal, from the thirtieth of June to the eighteenth of September 1915, amounted to 59,525 cargo tons, or seven-eighths of one per cent. of the total traffic. A small percentage of the traffic through the canal is carried by vessels having such routings and destinations as prevent the vessels and their traffic from being classified with reference to the five main routes among which the above table classifies the traffic through the canal. As shown by the table, the traffic over "miscellaneous" routes during the thirteen months' period amounted to 167,968 tons, or to only 2½ per cent. of the total canal tonnage.

The commercial usefulness of the canal as revealed by the traffic passing through the waterway is indicated most clearly by a statement giving the name and tonnage of each of the principal commodities shipped through the canal during the thirteen months preceding the temporary closing of the waterway in September 1915. Table 2 contains a list of the sixteen commodities

that contributed each 50,000 tons or more to the traffic of the canal during the first thirteen months of the operation of the canal. These sixteen commodities account for 57.6 per cent. of the total tonnage through the canal during the period in question. Among the commodities, other than those shown in the table, that were shipped in relatively large quantities through the canal were tin, coffee, miscellaneous manufactured goods, cacao, wool, cement, iron, copper ore, coke, vegetable oils, textiles, wines, creosote, chemicals, skins and hides, rice, wire fencing, seed, and beans. The official analysis of the traffic through the canal during August 1915, enumerates 122 commodities, some of the titles referring to groups of articles rather than to a single commodity. Thirty-five of the commodities thus listed moved in both directions through the canal.

TABLE 2

Tonnage of the Sixteen Principal Commodities Shipped through the Panama Canal, August 15, 1914 to September 18, 1915

Commodities	Atlantic to Pacific	Pacific to Atlantic	Total
Nitrates	471	1,074,961	1,075,432
Sugar	21,103	391,682	412,785
Coal	386,778	7,500	394,278
Petroleum, refined	351,734	34,550	386,284
Lumber	3,270	256,067	259,337
Manufactured goods of iron and steel	248,986	6,258	255,244
Wheat	7,542	231,439	238,981
Barley	.....	229,361	229,361
Iron ore	2,200	136,154	138,354
Railroad material	100,017	.....	100,017
Canned goods	9,494	65,614	75,108
Copper	3,658	67,222	70,880
Cotton, raw	52,976	13,780	66,756
Oils, crude	23,531	35,363	58,894
Flour	4,955	52,612	57,567
Machinery	48,370	1,049	49,419

As was to have been expected, the nitrate shipments from northern Chile to the United States and to Europe comprised the largest single item of traffic through the canal, in spite of the fact that the nitrate shipments to Europe were probably not more than 25 per cent. of what they would have been under normal conditions of world peace. The sugar tonnage was second in amount, and that consisted mainly of sugar from the Hawaiian Islands to refineries at Philadelphia and New York. The coal tonnage was third in rank and petroleum oil fourth. Coal and oil moved mainly westbound through the canal. Lumber ranked fifth in amount of tonnage, the shipments being nearly all from the Pacific ports of the United States and Canada to the Atlantic ports of the United States and Europe. Manufactured goods made of iron and steel, as was to have been expected, contributed largely to the canal tonnage and consisted, for the most part, of shipments from the eastern seaboard of the United States to the west coast of the United States, to Hawaii, and to Siberian ports. Wheat and barley made important contributions to the canal tonnage and consisted almost entirely of shipments from the Pacific coast of the United States to Atlantic ports in the United States and Europe.

A somewhat closer analysis of a few of the commodities shipped through the canal will serve

to indicate some of the relations of the canal route to the development of typical American industries. As representative of the extractive industries, coal and lumber may be selected. During the six months of 1915, March to August inclusive, 211,173 tons of coal were shipped through the canal, and all but 7,500 tons moved westbound. Nearly all of this coal came from Norfolk and Newport News, the canal having created an available market in Pacific ports for the products of the mines of West Virginia. During the same six months' period the lumber shipments amounted to 184,500 tons, of which all but 2,600 tons were taken through the canal eastbound from the Pacific ports of the United States and Canada to Atlantic ports of the United States and Europe.

The facts regarding the movement of coal and lumber through the canal during the seventeen days of September 1915 that the waterway was open to traffic are instructive. During those seventeen days there were about 28,000 tons of coal shipped through the canal, all of which came from Norfolk and Newport News, 570 tons going to San Francisco, while the remainder was taken to ports on the west coast of South America, principally of northern Chile. The lumber traffic during the seventeen-day period amounted to 17,471 tons, all but 70 tons of which was moved eastbound, 8,054

tons being shipped in the coastwise trade to New York and Boston, while nearly 9,000 tons were sent from Victoria, B. C., to Kingston, Jamaica, and to Liverpool, England.

As representative of products of manufacturing industries shipped through the canal, reference may be made to manufactures of iron and steel. During the six months of 1915, March to August inclusive, 164,743 tons of iron and steel manufactures were transported via the canal, and all but 4,020 tons moved westbound. These figures do not include machinery and railroad material, which consisted mainly of iron and steel, and which were shipped in relatively large quantities from the Atlantic seaboard of the United States to Pacific markets, particularly to Vladivostok. During the first seventeen days of September 1915, there were 13,448 tons of iron and steel manufactures shipped through the canal from the Atlantic to the Pacific, all but 1,500 tons of this originating in the United States. The shipments of railroad material through the canal from the first to the seventeenth of September 1915, amounted to 24,235 tons, all of which came from New York and most of which was taken either to the west coast of the United States or to Vladivostok and Kobe. About two-thirds of this railroad material was shipped directly to Vladivostok and Kobe, and it is possible that some of

that carried to Los Angeles and San Francisco was there transshipped to destinations beyond the Pacific.

The service of the Panama Canal to the industries of the United States consists not only of affording a wider market for American exports but also of enabling American industries to secure necessary material more advantageously. Indeed, some useful materials, as, for instance, iron ore from Chile, would not bear the cost of transportation to the eastern seaboard of the United States prior to the opening of the canal. Soon after the opening of the canal, the Bethlehem Steel Company established a line of bulk carriers to bring iron ore from Chile to Philadelphia and New York for shipment to the furnaces at South Bethlehem. During the six months of 1915, March to August inclusive, 70,504 tons of iron ore were shipped eastbound through the canal, most of it being taken to Philadelphia and New York. The largest export from the west coast of Chile has been nitrate of soda, which, in the past, has gone mainly to Europe. Since the opening of the Panama Canal, there has been much increased importation of nitrate into the eastern ports of the United States; in fact, on account of the war in Europe, shipments to the United States have been larger than to Europe.

Wool is another material which American in-

dustries can secure more economically because of the Panama Canal. In times past nearly all of the wool from Australia and China used in American mills has been purchased in London. The European War has temporarily increased the difficulty of securing wool via London, while the canal has, for the first time, made possible the economical shipment of wool directly from transpacific countries to New York and Boston. During the six months of 1915, March to August inclusive, about 20,000 tons of wool were shipped through the canal from Australia to Boston and New York. These wool cargoes came mainly from Melbourne and Brisbane, Australia, and from Shanghai and Yokohama. It is possible that the direct shipment of cargoes of wool from transpacific countries to New York and Boston may continue after the close of the European War, thereby making American industries less dependent than they formerly have been upon the London market as to the source of their wool supply.

The southern states of the United States, those bordering upon or tributary to the south Atlantic and Gulf seaboards, are in the section of the United States nearest to the canal, and the shipments from that part of the country consist of several commodities whose export will naturally be facilitated by the reduction in the cost

of transportation effected by the canal. Reference has been made to the movement of coal via Panama from Norfolk and Newport News to Pacific markets. The use of the canal by this commodity has thus far probably been slight as compared with what it will be in the future. The tonnage of coal shipped long distances is directly dependent upon the cost of transportation. Ocean freight rates, on account of the European War, have been so high since the opening of the canal as to make almost impossible the profitable sale of coal for commercial uses in distant markets. With the restoration of normal freight rates on the ocean, coal movements from the Atlantic and Gulf ports of the United States to Pacific ports north and south of the canal can hardly fail to be large. Likewise, there should be active demand in the countries about the Pacific for the fertilizers made from Tennessee, South Carolina and Florida phosphate rock, when freight rates again become low enough to make possible the long-distance transportation of such commodities as fertilizers.

As was anticipated, raw cotton has been shipped via the canal to Oriental and other Pacific markets. As is shown in Table 2, about 53,000 short tons of cotton, or 212,000 bales of 500 pounds each, were transported westbound through the canal during the thirteen months

ending with the middle of September 1915. In all probability, the cotton tonnage via the canal will steadily increase with the certain growth in the demand for the staple in the mills of Japan, China, and Australasia. As regards southern lumber, the canal has apparently not yet opened up new markets. The heavy lumber shipments via the canal have nearly all been eastbound. It can hardly be doubted, however, that a demand for the yellow pine and hardwood lumber of the South will develop in the markets on the west coast of South and Central America. Had there been such a demand during 1915, it could hardly have been met, because the high ocean freight rates would have made profitable shipments impossible.

The industries of the west coast states of the United States made large use of the canal from the outset. The lumber, wheat, barley and canned goods (fish, fruit, etc.) which are shipped in large quantities from the Pacific ports of the United States and Canada were able to reach their largest and best markets at greatly reduced costs of transportation; and, as Table 2 shows, those articles moved in large volume through the canal, even under the adverse conditions prevailing during the period for which the table gives figures. West coast products entered very largely into the intercoastal trade and also found a ready

market in such European countries as were able to engage in international trade. The Panama Canal, in spite of trade restriction due to the war in Europe, has given the western part of the United States and Canada larger industrial opportunities and a greater measure of prosperity.

CHAPTER VII

THE CANAL AND THE FOREIGN TRADE OF THE UNITED STATES

The United States Government undertook the construction of the Panama Canal because the work proved to be too great a task for the Panama Canal Company, the corporation that began the enterprise. It is obvious that the people of the United States, in doing this, must have been influenced by the desire to accomplish three results: The connection of the two seaboards of the United States by a more direct and more economical route for the intercoastal trade of the country, the reduction in the cost of reaching foreign markets with goods of American production, and the removal of the barrier which prevented the Atlantic and Pacific squadrons of the American navy from coöperating effectively in defending the country.

The purposes of the United States, however, were by no means entirely selfish. The Panama Canal, like the Suez waterway, was constructed not for the sole use and benefit of one country, but that it might be of service to all nations. The

ships of all flags and countries, in accordance with the policy to which the United States has consistently adhered for more than a half century, are to use the Panama highway under like terms, each nation being free to take full advantage of the new "gateway to the Pacific" in carrying on its commerce not only with the United States but with other countries. In constructing the canal and opening it to the commerce of all nations "on terms of entire equality," the United States voluntarily undertook to act as trustee of all nations in order that the world might thereby secure a benefit that could not otherwise have been obtained. To be of service to mankind is a nation's highest reward.

The truth of this assertion of altruism on the part of the United States in the construction of the Panama Canal is not invalidated by a frank admission that the people of the United States expect to derive large benefit from the canal—a larger benefit, indeed, than is to be secured by any other country. Because of its location, its resources, its assured economic development, and, most of all, because of its use of the Panama route in carrying on its intercoastal trade, the United States will secure greater assistance from the canal than any other single country can hope to obtain; although Canada and Europe, as will be pointed out in a later chapter, will profit

largely from the economies resulting from the use of the canal.

Commerce with foreign nations is subject to the control of forces different from those that have to be reckoned with in carrying on trade within the country; and, in this discussion of the relation of the Panama Canal to the development of the foreign commerce of the United States, it will be a help to clear thinking, and possibly to the avoidance of overstatement, to keep in mind certain controlling principles concerning industry and trade.

First among the facts to be kept in mind is, that international trade, as regards most commodities, is subject to worldwide competition. Except for the limited number of commodities, of which the particular country in question may possess a monopoly, success in securing foreign trade depends upon certain well known factors, chief among which are efficiency in production, economical means of transportation by land and by sea, skillful methods of merchandising, foreign investments and adequate international banking facilities. These essential factors of success in foreign trade have often been overlooked or neglected in discussions of the service which the Panama Canal will be to the foreign commerce of the United States.

Trade begins with production. A large activ-

ity in foreign commerce is impossible without diversification and efficiency in industry; moreover, this efficiency must obtain not only in the enterprises and establishments of individual producers, it must characterize the organization and conduct of the industries of the country as a whole. To meet international competition successfully, there must be brought about, for the country as a whole, such territorial division of labor and industry as will enable each section to engage in those activities for which it is best equipped as regards climate, resources, and labor supply. It is only when the productive energies of the entire country are so organized that all the various resources are intelligently utilized, and only when labor and capital are applied where they will produce the best results, that the national output can be of maximum volume and can be secured at minimum cost of production.

A second factor of controlling influence is transportation. The effective organization of production and the economical shipment of goods to the seaboard and to markets beyond the sea require the services of systematically developed, adequate, and economical means of transportation by land and by sea. The country as a whole needs to be supplied with railroads and with such inland waterways as can, at reasonable expense, be so improved as to increase the facilities and

reduce the cost of transportation. There is need, moreover, for a merchant marine under the national flag of tonnage and efficiency commensurate with the volume of the country's maritime commerce. To depend mainly upon foreign shipping for the transportation of exports and imports is to limit a country's foreign commerce at all times and to subject that commerce to temporary destruction during a period of war with or among strong commercial nations.

It should be the policy of the Government to bring about the coördinated development of railroads and waterways; and, while protecting the public against abuses, to assist the carriers in providing the country as a whole with a system of transportation that will permit the general development of all natural resources, and assist in the production of all commodities that can be profitably produced or manufactured for consumption at home or for exchange in other countries. It should also be the policy of the Government to establish conditions favorable to the construction and profitable operation of an adequate deep-sea fleet.

It is but recently that the people of the United States have come fully to appreciate the fact that success in foreign trade can only follow the attainment of economy and efficiency in production. Indeed, it was hardly to be expected that special

attention should be given to organizing and developing industry with a view to minimizing the cost of production and transportation in a country possessing an apparently limitless wealth of natural resources. As long as the protected domestic market readily took nearly all the products of manufacturers, and as long as commodities exported consisted mostly of materials and foods secured merely by appropriating natural resources and by drawing upon the fertility of a new continent, there was no special necessity for seeking to organize industry systematically, in order thereby to bring the costs of production and transportation in the United States below corresponding costs in other countries. The spur of necessity being absent, the United States has been later than European countries in establishing the conditions precedent to successful competition on a large scale for trade with foreign countries.

Past conditions are rapidly changing. Since 1890, and particularly since 1900, there has been a growing appreciation in the United States of the importance of a diversified foreign trade. This is evidenced by the fact that some of the leading manufacturing industries in the United States have successfully overcome obstacles and have built up a large trade abroad. Other industries are making headway, and the daily press, the reports of government officials, the delibera-

tions of chambers of commerce, and the conventions which business men are holding give evidence of an effort being made to master the problems of foreign trade development.

The Panama Canal was not constructed for the sole purpose of reducing the cost of reaching foreign markets, but prominent among the reasons for making the large expenditure required to bring the waterway into existence was the desire to effect a reduction in the cost of reaching markets abroad and to add to the facilities of foreign commerce. Previous chapters have considered the effect which the canal will have upon the length and time of ocean voyages and upon freight rates, and have thus indicated the transportation economies which the canal will bring about. These economies will be large and will be of much assistance to the foreign trade of the United States. Whether, with the aid thus received, American producers and traders will be able largely to expand the foreign commerce of the United States will, however, depend upon the success which American business men have in meeting or providing other requisites of foreign commerce.

The Panama Canal and the development of other needed transportation facilities will, together with the progressively efficient organization of industry within the United States, prob-

ably reduce the costs of production and transportation of American products to the level of similar costs in other countries, and the chief requisites of successful foreign trade will have been met by the people of the United States. Perhaps it is well, however, to call attention to what business men have already come to realize—that there are factors other than the costs of production and transportation, that determine success in foreign trade.

Commerce results from trading, and depends upon effective merchandising methods. Unless American producers, exporters, and importers are good merchants, they must be worsted in their efforts to secure foreign trade in competition with the skillful and experienced merchants of other countries. The domestic market has, in the past, so overshadowed the foreign market in practically all lines of production that only a few of the very largest producers and traders in the United States have had a strong incentive to adapt their merchandising methods to the demands of foreign buyers. Indeed, many American producers have not found it profitable to seek foreign trade by methods which European traders have found necessary; but that condition is passing away with the growth of the foreign commerce of the United States and with the enlarging opportunities for trade with other countries.

American manufacturers and merchants are now seriously studying the merchandising requirements of the foreign trade, and numerous educational agencies have undertaken to assist them in their study.

Another factor determinative of success in the development of the foreign trade of the United States, whether with countries reached via the canal or with countries approached by other routes, is the establishment by American banks of branches in foreign countries, particularly in South America and in regions beyond the Pacific. European traders have been greatly assisted in their foreign trade by the fact that international exchange has been provided by European banks, and by the fact that European banks, having branches in all parts of the world, have been able to provide the credit which European business men have required in undertaking commercial or industrial enterprises in foreign countries. More than one hundred European banks have branches in foreign countries, the number of such branches being said to exceed 2,000. More than one hundred of these branch banks are in South America, about three hundred in Asia, four hundred in Africa, and more than seven hundred in Australia, New Zealand and the Pacific islands. These branches of European banks scattered over the world have assisted European manufacturers

in making investments abroad and have given much aid to European traders in building up foreign commerce.

The Federal Reserve Act, approved December 23, 1913, has made it possible for national banks in the United States, with a capital and surplus of $1,000,000 or more, "to establish branches in foreign countries or dependencies of the United States for the furtherance of the foreign commerce of the United States." Acting upon the authority thus conferred, the National City Bank of New York, during the year 1915, established six branches, three in Brazil, one in Argentina, one in Uruguay, and one in Cuba. This is an encouraging beginning, although it is only the first step towards the establishment of American banking facilities for financing American enterprises abroad and for developing the foreign trade of the United States. It is to be hoped that the experiment of the National City Bank will be so profitable as to cause numerous other banks or associations of banks (if the law be so amended as to permit) to establish branches in foreign countries, particularly in those countries with which the United States may trade via the Panama Canal. If these international banking facilities are developed, there can be no doubt that their development will make possible a larger use of the Panama Canal.

The relation of the canal to the foreign trade of the United States may be concretely indicated by a brief analysis of the use that has been made and will be made of the canal in the trade of the eastern seaboard of the United States with western South America and with transpacific countries. This analysis leaves out of account the large trade of the western part of the United States with Europe and other countries adjacent to the Atlantic, and does not take into consideration the trade between the Atlantic-Gulf ports of the United States and the Pacific coast of Central America, Mexico and Canada. For the purposes of the present discussion, these omissions are not serious, because all the trade of the Pacific coast of North America with countries adjacent to the Atlantic will unquestionably use the canal and will increase more rapidly because of the assistance which the canal will render.

Up to the present, the trade of the west coast of South America has been mainly with Europe. The reasons for this are chiefly industrial. The exports from western South America have consisted, for the most part, of nitrate of soda, grain, copper, and various materials used in manufacture. More than half the tonnage of the west coast South American exports has consisted of nitrate. In the past, the natural market for the products of western South America has been

Europe. Being industrially undeveloped, the countries of western South America have imported mainly manufactures, which, as regards many commodities, could be secured in Europe at lower prices than in the United States. Moreover, the freight rates from Europe to western South America are especially low, because a large number of vessels which transport the nitrate and other bulky cargoes from western South America to Europe are obliged to make the outbound trip from Europe in ballast or with only partial cargoes. On the other hand, the freight rates from the eastern seaboard of the United States to western South America have, in the past, been relatively high. The imports from western South America have not been large, and there have been few, if any, vessels making the run in ballast from the Atlantic ports of the United States to western South America. Before the opening of the Panama Canal the distances were practically the same from New York and from Liverpool via the Straits of Magellan to the west coast of South America.

The relation of North and South America to each other geographically has been completely changed by the Panama Canal. As was pointed out in Chapter II, the west coast of South America lies directly south of the Atlantic seaboard of the United States. The distances from the

Atlantic-Gulf ports of the United States by way of the canal to the west coast of South America do not differ much from the distances from the United States to Europe. In trading with western South America there is a distance advantage in favor of the United States as compared with Europe equal to the width of the Atlantic. It is evident that the opening of the canal ought to result in the development of a larger trade between the eastern part of the United States and western South America, provided economic and commercial conditions are such as to call for the exchange of commodities between the two sections.

Table 1 in the preceding chapter shows that during the first thirteen months of canal operation 105 vessels carried cargo from the eastern part of the United States through the canal to Central and South America. The tonnage of these exports amounted to 399,776 tons and naturally all but a small part of the traffic went to western South America. The imports into the United States via the canal from Central and South America amounted to 963,326 tons, in the transportation of which 184 vessels made use of the canal. These figures of the traffic between the United States and western Central and South America are not to be compared with the figures of the traffic between Europe and those sections

of the Pacific. Europe, under normal conditions, would have a larger trade than the United States had with the Pacific ports of South America, but on account of the war Europe's trade was much less than that of the United States.

The exports from the United States to western Central and South America via the canal have consisted mainly of manufactures, machinery, petroleum oil, and cement. The sale of American manufactures on the west coast of Central and South America has been possible not only because of the canal, but also because of the war, which greatly restricted European exports.

The tonnage of imports into the United States from Central and South America via the canal during the first thirteen months of canal operation was 2 1/3 times the volume of the traffic in the opposite direction. This is accounted for partly by the fact that some vessels make the run from New York to Chile via the Straits of Magellan and return via west coast South American ports and the canal. There has, however, been an increase in traffic from western South America to the United States as a result of the opening of the canal. Two important commodities comprised in this traffic are nitrate of soda and iron ore. Before the opening of the canal, the cost of transportation restricted the nitrate imports and entirely prevented the shipment of iron ore from

the west coast of South America to the eastern seaboard of the United States. The iron ore tonnage of 136,154 tons represents a traffic made possible by the Panama Canal. In addition to nitrate of soda and iron ore shipments from the west coast of South America to the United States, copper ore, wool, tin, and hides were shipped in appreciable quantities.

For the trade of the eastern seaboard of the United States with Japan, China, the Philippines, Australia and New Zealand, the Panama Canal will be used for most shipments, but the trade of the United States with these countries via the Panama Canal must be secured in competition with Europe whose commerce with the Orient and Australia moves via the Suez Canal or via the Cape of Good Hope. To some extent the commerce of the Atlantic ports of the United States with the Pacific shores of Asia will, after the war, when navigation of the Mediterranean becomes safe, be carried on via Suez. As was pointed out in Chapter III, Hongkong and Manila are equally distant from New York via Suez and Panama, and vessels making voyages between New York and those ports will decide between the Panama and Suez routes after considering various factors affecting the earnings and expenses of voyages via alternative routes. In general, however, the trade of the Atlantic-Gulf seaboard of the United

States with Japan, China, the Philippines, and Australia will be via the Panama Canal; while the commerce of Europe, for the most part, will move via Suez and the Cape of Good Hope. It is by establishing conditions more favorable to the United States in competing with Europe for the trade in question that the Panama Canal will be of assistance to American producers and traders.

The extent to which the canal will assist American producers in developing a larger trade with countries beyond the Pacific is conditioned, first of all, upon the nature of the commerce of the Orient and Australasia. The trade of Japan is relatively large, its chief exports being raw and manufactured silk, tea, mattings, cotton goods, coal and copper, while its imports consist largely of rice and other foodstuffs, raw and manufactured cotton, iron and steel manufactures, and machinery. This partial list of the exports and imports of Japan shows that the trade of the country would naturally be carried on not only with China and India, but also to a large extent with the United States and Europe. Indeed, the United States affords Japan its best market; and, on account of the large demand in the United States for tea and raw and manufactured silk, especially raw silk, the United States takes nearly three-tenths of the country's exports. Japan's

purchases from the United States, while of only two-thirds the value of her exports to the United States, amount to about 17 per cent. of the country's total imports. American products sent to Japan include raw and manufactured cotton, petroleum, also machinery and other classes of heavy manufactures.

It will be difficult, even with the assistance of the canal, for American producers to secure a large increase in exports to Japan. Japan now secures a large part of her imported foods from southern Asia and also much of the cotton required for her factories. Great Britain, Germany, Belgium and other European countries have, in the past, supplied Japan with most of her imported manufactures. It is evident that strong competition must be overcome by American exporters; on the other hand, the outlook for an increase in imports from Japan is more favorable. A large increase in silk manufacturing in the United States is to be expected, and this will require greater importations of raw silk. It is also probable that other products of Japan will find a larger market as a result of the more favorable conditions of trade established by the opening of the canal.

The United States has a relatively small share of the trade with China. Only 6 per cent. of China's imports come from the United States,

and only 9 or 10 per cent. of her exports are sent to the United States. China ranks next to Japan in the exportation of raw silk and also is a large producer of tea. These are the two most important articles imported from China into the United States. Among other articles which American importers secure from China are carpet wool, hides, straw braid, and "curios" of various kinds. China is a large importer of cotton goods and petroleum, and, during recent years, has purchased railway equipment and other manufactures of iron and steel. China obtains these and other articles in the United States, as well as from other countries, and, until the development of the cotton manufacturing industries in Japan, there was prospect of a large increase in the exportation of cotton goods from the United States to China. The development of this trade in the future, however, will be under conditions of strong competition.

In considering the canal with reference to the development of the trade of the United States with Japan and China, it should be noted that the imports from those countries into the United States, being of high value in comparison with their bulk, can be, and are, largely brought into the United States through the Pacific ports, whence they are shipped to the markets and mills of the central and eastern states. During the

thirteen months ending with the middle of September 1915, 32, but only 32, vessels came to the United States from Australia and the Far East via the canal, bringing 201,000 tons of cargo, whereas during the same period 154 vessels went from the eastern United States via the canal to Australia and the Far East carrying 994,000 tons of cargo. The figures for Australasia and the Orient are not stated separately in the official statistics.

Australia and New Zealand export large quantities of wool, meat, and grain. With the exception of wool, the products of Australia do not find a large market in the United States; on the other hand, the imports into Australia and New Zealand, which consist largely of textiles, iron and steel, machinery, and general manufactures, include articles that the United States has been able to supply in considerable quantities in spite of the difficulties of competing with British and other European manufacturers. While less than 4 per cent. of the exports of Australia and New Zealand reach the United States, more than 11 per cent. of their imports come from the United States. Such was the situation before the opening of the canal which has so reduced the cost of reaching Australia as to make it probable that American goods will be able, in the future, to compete more successfully than they have in the past

with the exports from Great Britain and other European countries.

The commerce of the Philippine Islands and the participation of the United States in the trade of the islands will be somewhat, although not greatly, assisted by the Panama Canal. At the time of the opening of the canal the Philippine Islands were receiving over one-half of their imports from the United States and were sending thither 43 per cent. of their exports. At the end of June 1915, after the canal had been in operation for 10½ months, the trade of the United States with the Philippines included 45 per cent. of the exports of the islands. Up to that time the United States had not increased its share of the Philippine imports.

The conditions under which foreign commerce was carried on during the thirteen months that the canal was in operation before it was temporarily closed on account of the slides of September 1915, were so abnormal that it is difficult to forecast the effects the canal will have upon the development of trade between the eastern seaboard of the United States and countries beyond the Pacific. Shipping facilities during this period were greatly restricted, freight rates were especially high, and the demand for many commodities in transpacific countries was lessened as a result of the European War.

Among the concrete effects of the canal were the direct shipments of wool from Australia and China to Boston, and the establishment of a Japanese steamship line operating between Japan and New York by way of Panama. The steamship lines that had been operated between New York and Australia via the Cape of Good Hope were shifted to the Panama route. The large development of the Australian and transpacific trade of the United States made possible by the canal will, necessarily, come slowly as the changed conditions of international competition work out their consequences. It is too soon, yet, to measure or definitely forecast the ultimate effects of the canal upon the commerce of the eastern and southern part of the United States with lands beyond the Pacific Ocean.

CHAPTER VIII

THE CANAL AND THE AMERICAN MARINE

For many years prior to the outbreak of the European War, the American marine in the foreign trade either actually declined or made only slight gain year by year. At the same time, the volume and value of American foreign commerce increased rapidly, until less than one-tenth of the exports and imports of the United States was carried in ships under the national flag. Such American ships as were employed in foreign commerce were, for the most part, engaged in the trade with nearby countries, while the overseas trade with distant ports made use almost entirely of foreign vessels. Tourists returning from South America, Europe, or transpacific lands never fail to remark upon the fact that the American flag is rarely seen abroad or that it is entirely absent from the channels of international commerce and the great ports of the world.

The European War, together with the act of Congress, approved August 18, 1914, which permitted and made easy the admission of foreign-

built vessels to American registry, has brought about, at least temporarily, a large increase in the tonnage of the American deep-sea fleet. Under this act, prior to the first of August 1915, 150 foreign vessels of 528,408 tons gross were transferred to the American flag, and the gross tonnage of sailing vessels and steamers registered for the foreign trade amounted to 1¾ million tons, of which 1 1/3 million tons consisted of steamers; but, after this increase had taken place, the American marine in the foreign trade had only one-tenth the tonnage of the shipping of the United Kingdom. This ratio of one to ten also applies to the number of American and of British ocean-going vessels of over 3,000 tons gross register, there being ten such ships under the British flag to one under the American.

In the coastwise trade and on the Great Lakes there is a relatively large fleet of American vessels, including steamers, large barges, and sailing vessels, and having an aggregate gross tonnage of nearly 6,500,000 tons. The merchant marine enrolled for the domestic trade consists entirely of vessels of American construction and ownership, ships of foreign origin and ownership having been excluded for a full century from traffic between ports of the United States. Being thus protected, the marine in the domestic trade has not been affected by the forces that have lim-

ited the development of American shipping in the foreign trade where international competition has been and must always be controlling. In all probability, the policy of reserving the domestic trade to American shipping will be continued. For reasons stated below, a change of policy under present conditions would be unwise.

During the decade preceding the Civil War, the American marine in the foreign trade reached a gross tonnage of 2,500,000 tons and transported two-thirds of the foreign commerce of the country. For nearly a half-century after the Civil War the American marine in the foreign trade declined. The causes were primarily economic, but navigation laws, which should have sought to remove the obstacles imposed by economic conditions, increased the handicap of the American shipowner in competing with foreign carriers. The cost of constructing a ship in an American yard was higher than in a foreign yard, and the operating expenses were greater for a vessel when under the American flag than when under a foreign ensign. The higher construction costs in the United States were due to economic causes; the greater operating expenses under the American flag were the result partly of the relatively high wages and high prices prevailing in the United States and partly of the requirements of the navigation laws.

Without going into details, it is sufficient to

say that the American marine in the foreign trade declined throughout most of the half-century intervening between the American Civil War and the great war in Europe, because the people of the United States could not profitably employ capital extensively in owning and operating vessels under the American flag in competition with foreign shipping. Over some ocean routes, particularly those to Gulf and Caribbean ports, profits could be made in the ocean shipping business; but it was generally possible for American capital to secure larger returns from investments in domestic industries than from the purchase of vessels and their operation in the foreign trade.[1]

The handicap which the higher cost of vessels for American registry has in the past imposed upon the development of the American marine has been removed by two recent laws: The act of Congress, approved August 24, 1912 (Section 5 of the act providing for the operation of the Panama Canal), which permitted foreign-built vessels not over five years old to be admitted to American registry; and the emergency Ship Registry Act of August 18, 1914, which removed the restriction

[1] The mercantile marine policy of the United States and the causes of the decline of the American marine in the foreign trade are discussed in Chapters XVIII to XX of the writer's volume on *Ocean and Inland Water Transportation.*

that the foreign-built vessels must be "not more than five years old at the time they apply for registry." A citizen or corporation of the United States desiring to purchase a vessel for operation in the foreign trade may now buy the ship either of an American or of a foreign builder, and presumably the buyer's decision will depend upon relative costs, and competitive merits of American and foreign vessels.

Moreover, it is quite possible that American shipbuilders may, before many years, be able to meet the prices of their foreign competitors. Ships have been built at lower cost in British than in American yards, because labor and materials have been cheaper in the United Kingdom, and because the British yards have constructed a larger tonnage and have been able to standardize construction. In an American yard, ships of many types are built at once, each vessel thereby having a high individual cost; whereas a typical British yard is able to specialize on vessels of a single type, to construct several ships from the same plans, and to secure labor, materials, parts, and fittings at costs per unit of product much lower than the unit costs incurred in building a single vessel. Just as the real estate operator can build a block of houses at costs much lower per house than the cost of constructing only one residence, so the British shipbuilders have been able to con-

struct ships wholesale at lower costs than they could be built, retail, in the United States.

The advantages of the British and other European shipbuilders over the American will be less after the close of the present war than they have been in the past, and will tend to diminish with the natural growth of American shipyards in number and output. It seems certain that the destructive war now in progress must so reduce the volume of capital and the number of laborers as permanently to raise interest rates and wages in Europe. This will increase the British and German shipbuilders' capital and labor costs and make materials (plates, boilers, fittings, etc.) more expensive, and while this is occurring the growth in the output of American yards will enable builders to lower unit costs. Although experience alone can determine the possibility of successful future competition of American with foreign shipbuilders, the prospects for the shipyards in the United States are more encouraging today than they have been for three decades.

The Panama Canal will not directly, and probably not materially, assist the American marine to compete with foreign shipping. The conditions of competition will not be affected. Indirectly, however, the canal may, and doubtless will, aid in the development of the American overseas marine by increasing the volume of the for-

eign commerce of the United States, enlarging the tonnage of traffic to be transported, and creating a demand for shipping, American or foreign. In general, the conditions affecting the growth of the American marine will be more favorable as a result of the canal; because, other things being equal, an acceleration of the expansion of foreign commerce creates not only a demand for more ships but also an opportunity for their employment at profits that are higher and firmer than prevail during periods of stationary or declining trade.

The stimulating effect of the Panama Canal upon the American marine engaged in the coastwise trade was felt nearly two years before the waterway was opened. The account given in Chapter IV of the services through the canal states the number of vessels and indicates the importance of the fleet operated between the two seaboards during the year 1914-15. The large tonnage of freight readily secured by the intercoastal lines led to the placement of orders for the construction of several additional vessels for the canal service. The American-Hawaiian, the Luckenbach, and the Atlantic-Pacific companies all had vessels for the canal service under construction during 1915.

As has been pointed out, the tonnage of vessels that used the canal in the intercoastal trade dur-

ing the thirteen months ending with September 1915 was larger than had been predicted, although the European War so restricted the tonnage of vessels available for the world's international commerce, particularly for the foreign trade of the United States, as to create an abnormal demand for vessels in international commerce and to raise freight rates to such a high level that ships which would otherwise have been used in the coastwise traffic between the two seaboards of the United States were diverted to the transportation of goods between the United States and foreign countries. With the establishment of peace in Europe and the restoration of the world's shipping to commercial uses, ocean freight rates will soon return to a normal level, and, in course of time, though possibly not immediately, an expansion of the American coastwise fleet may be expected to follow, provided freight traffic in adequate volume can be secured by the coastwise carriers. The relatively large intercoastal shipments during the first year of the canal's operation, when vessels were in great demand for service in the foreign trade, makes it highly probable that coastwise freight will, in the future, give profitable employment to a steadily increasing tonnage of ships.

This will, however, depend upon the continuance of the present policy of reserving the coast-

wise traffic to American ships. The admission of vessels of foreign construction and ownership to the coastwise trade would be a serious mistake; although, without doubt, freight rates between the two seaboards of the United States might temporarily be lower if foreign vessels were allowed to enter the intercoastal service. If foreign vessels were permitted at the present time to compete in this service with ships of American construction, coastwise vessels under the American flag would soon be reduced to a small tonnage. When this had taken place, there would probably be a rise in the rates charged by the coastwise lines, and in the meantime the industry of building ships in American yards would have suffered greatly, if it had not been seriously crippled.

It is of importance to American industry and commerce that there should be a large tonnage of vessels in the coastwise fleet, and that the business of the coastwise carriers should be profitable enough to insure their successful development; but it is of vital necessity, from the standpoint of the growth and efficiency of the American navy, that there should be a large American coastwise fleet. The merchant marine is the foundation of the navy; and, having but a small tonnage of vessels under the American flag in the foreign trade, it would be the height of unwisdom for the United

States to cripple its coastwise shipping fleet and endanger the profitable development of American shipyards by allowing foreign shipping to engage in commerce between the ports of the United States.

During 1911 and 1912, when the Panama Canal Act, approved August 24, 1912, was under consideration, there was an active propaganda carried on to bring about the exemption of the owners of coastwise ships from the payment of tolls for the use of the Panama Canal. The advocates of this policy were at first successful, and the act of August 24, 1912, exempted coastwise shipowners from the payment of canal tolls. This action was not satisfactory to the country. It was the belief of a large share of the people of the United States that the exemption of the coastwise shipowners from canal tolls was a violation of the Hay-Pauncefote Treaty which the United States had entered into with Great Britain in 1901; and it was realized by a majority of the people of the country, when the question was understood, that the exemption of coastwise ships from the payment of Panama tolls was the grant of a subsidy to that part of the American marine which was not in need of further assistance. President Wilson, early in his administration, urged Congress to repeal the provision of the act of 1912 exempting coastwise shipping from canal tolls, and the

President's recommendation was carried out by act of Congress, approved June 15, 1914.

Even before the opening of the canal, the coastwise carriers, including those engaged in traffic between the two seaboards of the country, had found their business profitable, and the tonnage of the coastwise fleet was increasing at a satisfactory rate. The opening of the canal reduced the cost of transportation between the seaboards of the United States fully one-third, enlarged the volume of traffic available for the coastwise carriers, and gave the coastwise lines an opportunity to do an increased business at lower costs per ton of freight. The large use made of the canal by the coastwise carriers is evidence that the waterway must have aided those engaged in transportation between the two seaboards of the United States. The complete protection of the coastwise carriers from the competition of vessels of foreign construction and ownership affords ample assistance, and a subsidy or subvention in the form of toll exemption would have been an unnecessary and unjustifiable gratuity.

What, if anything, can be done by the United States Government to make the canal of greater assistance to the merchant marine in the foreign trade? The answer to this question is necessarily the answer to the larger question: What measures can be taken to bring about the development

of the merchant marine under the national flag? As was pointed out above, the general problem to be solved is the reduction of the cost of operating vessels. If possible, the expenses of operating vessels under the American flag must be made approximately the same as the expenses of operating vessels under foreign flags. If the expenses of American and foreign vessels cannot otherwise be equalized, such government aid must be given American vessel owners as will remove the handicap under which American ships compete with foreign vessels. Stated broadly, the problem is one of making attractive to private capital the business of owning and operating vessels under the American flag.

It is, perhaps, well to emphasize the fact that the issue, as stated, cannot be avoided. American shipping must be able to enter into competition with foreign ships without serious handicap, if there is to be a larger merchant marine under the American flag. If the handicap against the American ship, due to economic forces or to navigation laws, cannot be overcome, or if the obstacles, though removable, are maintained by the insistence of Congress upon continuing present laws, there can be no prospect of a large increase at an early date in the tonnage of the American marine in the foreign trade.

The thing to be done first is to establish a Fed-

eral shipping board, composed of three or five men having expert knowledge of shipping questions, and to intrust the board with the duty of ascertaining exactly how much and in what particulars the expenses of operating ships under the American flag are greater than the expenses of operating vessels under foreign flags. On the basis of the information thus obtained, the board should inform Congress what legislation is required to equalize the conditions of competition between American and foreign ships. The establishment of a shipping board with large discretionary powers is the first step to be taken in legislating for the development of the American merchant marine, because the problems to be solved are of a technical nature and are executive rather than legislative in character.

Legislation and regulatory measures for building up the merchant marine must concern themselves with numerous technical questions. The shipping business is governed by a complex body of navigation laws dealing with the construction, registry, and measurement of vessels, with boiler and hull inspection, with the enforcement of laws regarding the employment and discharge of seamen, and with many regulations concerning the operation of vessels, it being necessary for the Government to enforce such rules as are required to protect the property of shippers, to insure the

welfare of seamen, and to safeguard the lives of passengers. Effective legislation upon subjects of this kind must necessarily deal mainly with the establishment of standards and with general requirements, leaving the application and enforcement of the laws to an expert administrative body having discretionary power.

It is especially important that the administrative character of the task of government regulation and aid of the merchant marine should be appreciated. The success of legislation concerning shipping must depend upon the efficiency of the executive agency intrusted with the enforcement of the laws. At the present time, the administration of the shipping laws is intrusted to several bureaus. While each of these bureaus is managed with ability, the net result is less satisfactory than it would be if there were a greater degree of unity in the administration of shipping laws. This unity can best be brought about by subordinating the various bureaus to a shipping board vested with adequate powers.

If, as is probable, the shipping board, after thorough investigation, finds that the Government must give aid to American shipowners to enable them to compete on equal terms and successfully with foreign shipowners, Congress should leave to the shipping board the expenditure of funds which the Government appropriates

in aid of shipping. Instead of the enactment by Congress of a law granting a general navigation bounty or making appropriations to lines designated in the statute, it would be wiser for Congress to act in accordance with the technical and administrative character of the general problem of rendering effective government aid to the merchant marine, and to authorize the shipping board to enter into contracts with a limited number of steamship lines from the United States to foreign countries. The selection of the lines to be aided should be left to the shipping board, also the amounts to be paid and the formulation of the provisions of the contracts made by the Government with the lines assisted. It is quite certain that, by giving to the shipping board the responsibility of selecting the lines that will be of most assistance to the development of the foreign commerce of the United States, better results can be obtained than by the passage of laws granting subsidies such as have previously been given by Congress. The task to be accomplished being executive in character, its performance should be intrusted to an able body of experts vested with power to exercise its discretion in using the funds appropriated by Congress.

Effective legislation for the promotion of the American marine in the foreign trade ought not to be postponed; in fact it should have preceded

the completion of the Panama Canal. The opening of the canal increases the need for a larger American marine in the foreign trade and gives the vessels under the flag of the United States a greater opportunity. Having invested $400,000,000 in the construction of the Panama Canal, it would be a serious mistake for the people of the United States to neglect to adopt such a policy toward the merchant marine as will enable the canal to be of effective assistance in restoring the marine to the place it held in American commerce at the middle of the nineteenth century. It is not to be expected that this can be accomplished all at once or in a few years, but it should be the definite aim of the people and Government of the United States to bring about this desirable result ultimately and at the earliest practicable date.

CHAPTER IX

EUROPE'S INTEREST IN THE PANAMA CANAL

Before the United States Government undertook the construction of the Panama Canal, a company of Frenchmen, incorporated by France, attempted to accomplish the task. The Panama Canal Company—*La Compagnie Universelle du Canal Interocéanique*—was organized and obtained its concession from Colombia twenty-five years before the United States obtained from the Republic of Panama the grant of the Canal Zone and the right to build the canal. The ten years of heroic effort on the part of the French to pierce the Isthmus failed partly because the company's financial management was too loose, but more because the work was carried on before the methods of controlling yellow fever and checking malaria were known. The experience of the Panama Canal Company made it clear that the canal must be made a government undertaking, and the European capitalists reluctantly turned over the task to the United States, whose funds for canal construction and whose success in the execution of the great work to be done did not depend upon

the sale of stocks and bonds of a corporation, the value of whose securities was determined by the prospective revenues from the operation of the canal if and when completed.

A review of the history of the attention given to the project of a canal across the American Isthmus by the European governments from the time of Columbus to the days of De Lesseps is outside of the purpose of this chapter which is concerned with an analysis of the commercial and political interest of Europe in the completed waterway, now open on terms of entire equality to the commerce of all nations, but owned and operated by the United States, between which country and European nations there must unavoidably be more or less commercial and political rivalry.

From the standpoint of commerce, Europe's interest in the Panama Canal is twofold. As the result of opening the canal, Europe is compelled to face a stronger and more extended competition with the United States for the trade of all countries bordering the Pacific Ocean; but, while the relative advantages of Europe over the United States for the trade of Pacific countries have been lessened by the canal, the waterway has so reduced the costs of transportation between Europe and the west coast of North and South America as to be of much assistance to the commerce of

Europe. Europe thus stands both to lose and to gain from the canal.

The changed conditions of competition between Europe and the eastern seaboard of the United States for the trade of Pacific countries, resulting from the opening of the Panama Canal, were indicated in Chapter III which set forth the effect of the canal upon the length of ocean routes and the time of voyages. By way of the Straits of Magellan the distance from New York to Valparaiso, Chile, is 8,380 nautical miles, while from Liverpool the mileage is 8,747, the distances being nearly equal. Via the Panama Canal, Valparaiso is 4,633 miles from New York, and 7,207 miles from Liverpool, New York now having an advantage of 2,574 miles over Liverpool in trading with Valparaiso and all other west coast South American ports. The ports of the west coast of Central America and North America by way of the canal are, likewise, 2,574 miles nearer New York than Liverpool. As compared with Hamburg, Germany, New York has a distance advantage of 3,093 miles in trading with the ports of the Pacific coast of the Americas. New Orleans and the other Gulf ports, being nearer than New York to the canal, have a correspondingly greater distance advantage over Europe in trading with Pacific ports north and south of the canal.

Before the opening of the Panama Canal

Europe was much nearer to Japan and China than was the eastern seaboard of the United States. Via the Suez Canal, which is the shortest route, the distance from Liverpool to Shanghai (including calls at Aden, Colombo, Singapore, and Hongkong) is 10,637 nautical miles; from New York the distance is 12,525 miles, the advantage in favor of Liverpool being 1,888 miles, because Liverpool is that much nearer than is New York to Gibraltar. The Panama Canal removes this handicap against New York. As shown by Map 4, Chapter III, page 41, Shanghai is practically the same distance from New York via the Panama route as from Liverpool by way of Suez. Japan is now appreciably nearer to the eastern part of the United States than to western and northwestern Europe, the distance from New York to Yokohama via Panama and San Francisco being 9,798 miles, while from Liverpool to Yokohama via Aden, Colombo, Singapore and Hongkong the distance is 11,678 miles.

The commerce between the eastern ports of the United States and Australia, before the Panama route was available, moved via Cape Town and the Cape of Good Hope. Although the distance from north Europe to Australia is less via Suez than by way of the Cape of Good Hope, the difference in the length of the two routes is not great enough to cause many freight vessels to take the

Suez instead of the Cape route; and thus, under former conditions, the commerce both of Europe and of the eastern part of the United States with Australia was, for the most part, carried past the Cape of Good Hope. Via that route the distance from New York to Australian ports was 780 miles more than the distance from Liverpool. Via the Panama Canal Sydney is 9,811 nautical miles from New York, while from Liverpool to Sydney the distance via the Cape of Good Hope is 12,626 miles. Melbourne and Adelaide are farther from New York than Sydney is and are also on the way from Liverpool to Sydney, but both Adelaide and Melbourne are now somewhat less distant from New York than from Liverpool, Hamburg, and the other ports of northwestern Europe. The line connecting points equally distant from New York via the Panama Canal and from Liverpool via Suez is indicated on Map 4, page 41.

The few references here made to the effect of the Panama Canal upon the relative distances from Europe and from the eastern part of the United States to the Pacific ports of North and South America, Japan, China, and Australia show that one important factor affecting the conditions of competition of the United States with Europe for the trade of Pacific countries has been so altered as to convert a handicap against the United States into a distance advantage over

northern and western Europe; but, as was pointed out in Chapter III, it must be borne in mind that there are several factors other than relative distances that determine not only the routes over which commerce actually moves, but also the success attained by any particular country in competing with other countries for the trade of the world. European producers and traders have had, and upon the termination of the present war will again have, the advantage over their American competitors in ocean-shipping facilities, international banking agencies, and even as regards methods of merchandising. It is only by removing or offsetting these handicaps that the people of the United States can largely benefit from the distance advantages created by the construction of the Panama Canal.

Although European countries have been somewhat apprehensive as to the possible effects of a more active competition with the United States for the trade of the Pacific, the feeling apparently has been and is that the Panama Canal will assist much more than it will hinder the development of the commerce of Europe. The canal will be of great absolute benefit to Europe. Indeed, in normal times, European traders and shipowners will use the canal more largely than will American merchants and carriers, and the reductions in the costs of transportation will doubtless enable

European commerce to develop more rapidly in the future than it has in the past, despite the more favorable position which American commerce will be given by the canal. A brief survey of Europe's traffic interest in the canal will make this evident.

Before the canal was opened, the tonnage of Europe's trade with western South America was six times the tonnage of the commerce of the United States with that section. The exports from western South America, which consisted largely of nitrate of soda, grain, and copper, found their natural market mainly in Europe; while European manufacturers supplied the Pacific seaboard of South America with most of its imports. Had it not been for the great war in Europe which started at the time of the opening of the canal, Europe's trade with western South America would have continued to be several times the volume of the commerce between the United States and the countries south of Balboa. As a result of the war, the greatly reduced trade of western South America has been more largely with the United States than with Europe; but this will soon change with the restoration of peace. It is probable that about a third of the total tonnage of the Panama Canal will be of the trade between Europe and western South America. It is obvious that a reduction in the cost of transporting this large volume of commerce will bene-

fit Europe largely, and will assist its manufacturers and merchants in extending their trade.

The population and industries of Central America are mainly in the western part of the region, and trade, with the exception of that in bananas and logs, is carried on principally at the Pacific ports. The coffee, cacao, and rubber plantations and the cattle ranches having been developed mainly by Englishmen, Germans, and Frenchmen, the exports of Central America have gone chiefly to Europe whence most of Central America's imports have been derived. The trade of Europe, as well as that of the United States, with Central America will be greatly facilitated by the Panama Canal.

Europe as well as the United States will benefit from the assistance which the canal will give to the exchange of commodities between the west coast of the United States and countries beyond the Atlantic. The grain, lumber, fish, fruit and other exports of Washington, Oregon, and California will go largely to Europe and at lower transportation costs to European buyers. In all probability, a larger use of European wares and products in the western part of the United States will result from the closer commercial relations which the canal will establish between Europe and the Pacific ports of the United States.

British Columbia and its commerce with east-

ern Canada and with Great Britain and other European countries have an interest in the Panama Canal second only to the interest which the two seaboards and the intercoastal trade of the United States have in the isthmian waterway. Until the Panama route could be used, the industrial and commercial progress of British Columbia was greatly hindered by the cost of getting the natural exports, lumber, fish, and grain, to the only markets in which the products could be sold in large quantities. Freight rates for transcontinental shipment by rail being well nigh prohibitive, traffic with Europe was necessarily carried around South America or subjected to the expense of double handling and of rail transportation at the Isthmus of Tehuantepec or Panama.

It was pointed out above that the eastern seaboard of the United States is brought much nearer Australia by the Panama Canal. This may be expected to aid in the development of the commerce of Australia with the United States, and to intensify the competition of American and European producers for the trade of Australia. This will presumably not be of direct benefit to the manufacturers and merchants of Great Britain and other countries of Europe; but it ought to enable Australia to advance more rapidly in industry and commerce. Viewing Great Britain in the larger sense of "Greater Britain," what is

of assistance to an important unit—in the case of Australia a continental unit—is a benefit to the Empire as a whole and particularly to the ancient mother realm that is the political center, the heart of the world-wide Britain that lies beyond the seas. The political and economic unity of the British Empire has become so close that the fortunes of one section are the fortunes of all.

Europe's interest in the Panama Canal from a naval point of view is hardly inferior to its interest from an economic standpoint. The use of the canal under terms of impartial neutrality by all countries not at war with the United States was naturally desired by all the great maritime powers. Several European nations have possessions in the West Indies, Great Britain has a strong naval base in the islands, and it was natural that all nations, including not only those having possessions in the West Indies, but all maritime powers, should desire to be able freely to move their naval squadrons from the Atlantic to the Pacific or in the opposite direction as often as the efficient use of their navies may make necessary or advantageous.

By the Hay-Pauncefote Treaty of 1901 the United States gave its pledge that the canal would be open to the vessels of war of all nations on terms of entire equality. The United States became the sole guarantor of the neutrality of the

canal and laid down the rules that she would enforce to insure the neutral use of the canal. This guaranty and these rules were embodied in a treaty with Great Britain, because it was necessary to make a treaty that would supersede a former convention—the Clayton-Bulwer Treaty of 1850—by which the United States and Great Britain had agreed that neither country would obtain exclusive control over an isthmian canal, and that they would be jointly responsible for the neutrality of any canal that might be constructed; but the obligation which the United States voluntarily assumed in entering into the Hay-Pauncefote Treaty runs to the benefit not of Great Britain alone; it is a pledge made to all nations. In fulfilling its obligation to maintain the neutrality of the Panama Canal, and in keeping, as it will, its solemn pledge, the United States will confer a naval benefit upon the maritime powers not only of Europe, but also of Asia and of the Americas.

It is obvious, however, that the United States will derive far greater naval advantages from the Panama Canal than will European or other foreign nations; and, in so far as the canal affects the relative naval strength of the United States and other countries, the canal may be regarded by foreign nations as a detriment rather than a benefit.

The canal is, indeed, a most valuable naval as-

set of the United States whose wide-reaching territory fronts the Atlantic and Pacific. Not only for domestic reasons, but also because of the international obligations which the United States, as one of the great world powers, cannot avoid, and would not wish to shun, the United States must maintain on each ocean a fleet strong enough to police its coasts, defend, if need be, its seaboards, protect American commerce, and fulfill the international obligations that have been assumed, particularly the obligations as regards countries of Central and South America. A large and increasingly difficult task is, thus, imposed upon the American navy.

The Panama Canal has brought the formerly separated squadrons of the United States navy closer together; it has increased the mobility of the naval fleet as a whole by making it possible for squadrons to pass quickly from ocean to ocean; and, what is possibly of greater importance, it has enabled the United States to establish at the canal a well-equipped naval base protected by strong fortifications. It is apparent that it must be of great strategic value to the United States to have, at the sole gateway between the Atlantic and Pacific, coaling stations, docks, machine shops and a well equipped naval base at which fleets may be assembled, from which squadrons may proceed to perform their assigned tasks,

and to which they may confidently return for coal, supplies, and necessary repairs.

It is to be hoped that the time may come when neither the Panama Canal nor any other work or locality of possible strategic importance will need to be considered with reference to naval efficiency or with regard to military strength and weakness. Possibly that day may come sooner than the present distracted state of the world would seem to make probable; but, for the present, no great nation, however peaceful its purposes nor however fortunate it may thus far have been in avoiding war, can wisely ignore the possibility of international conflict and neglect to safeguard itself against attack. The naval significance of the Panama Canal is necessarily of interest to the United States and to all nations.

It is a fortunate circumstance that the United States has from first to last adhered to the principle and policy of a neutralized isthmian canal. In subscribing to the Clayton-Bulwer Treaty of 1850, at a time when it was supposed that a private corporation would construct the canal across the Isthmus, the United States agreed with Great Britain that the canal, "being open to the citizens and subjects of the United States and Great Britain on equal terms, shall, also, be open on like terms to the citizens and subjects of every other nation which is willing to grant thereto such pro-

tection as the United States and Great Britain engage to afford." When it became evident that the canal, if constructed at all, must be built by the United States Government, Great Britain agreed to such amendment of the Clayton-Bulwer Treaty as would free the United States from her agreement not to obtain control over (i. e., construct) the canal or to "erect or maintain any fortifications commanding the same."

The only stipulations made by Great Britain in acceding to the request of the United States for the modification or abrogation of the Clayton-Bulwer Treaty were that the United States should agree to the neutralization of the canal and that all vessels, American and foreign, should pay the same tolls. The neutralization of the canal was the main issue considered in the negotiations that resulted in the Hay-Pauncefote Treaty. In the draft of the treaty as first submitted to the Senate it was provided that the United States should not fortify the canal and that the United States should neutralize the canal by entering into treaties with the several powers. These provisions were objectionable to the Senate which so amended the proposed treaty as to cause Secretary of State Hay, after due negotiations, to submit to the Senate another draft of a treaty which made no mention of fortifications and which provided that the United States should alone assume

the obligation to maintain the neutrality of the canal.

As stated in the Hay-Pauncefote Treaty, the United States and Great Britain entered into the treaty "to remove any objection which may arise out of the Convention of the 19th April, 1850, commonly called the Clayton-Bulwer Treaty, to the construction of such canal under the auspices of the Government of the United States, without impairing the 'general principle' of neutralization established in Article VIII of that Convention;" and, to give effect to this purpose, the Hay-Pauncefote Treaty formulates in Article III certain rules which "the United States adopts as the basis of the neutralization of such ship canal." The first of these rules provides that the canal shall be "open to the vessels of commerce and of war of all nations observing these rules on terms of entire equality."[1]

[1] Article III of the Hay-Pauncefote Treaty is as follows:

The United States adopts, as the basis of the neutralization of such ship canal, the following rules, substantially as embodied in the Convention of Constantinople, signed the 28th October, 1888, for the free navigation of the Suez Canal, that is to say:

1. The canal shall be free and open to the vessels of commerce and of war of all nations observing these rules on terms of entire equality, so that there shall be no discrimination against any such nation, or its citizens or subjects, in respect of the conditions or charges of traffic, or otherwise. Such conditions and charges of traffic shall be just and equitable.

The maintenance of the principle of a neutralized Panama Canal was again pledged by the United States in the treaty signed with the Re-

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2. The canal shall never be blockaded, nor shall any right of war be exercised nor any act of hostility be committed within it. The United States, however, shall be at liberty to maintain such military police along the canal as may be necessary to protect it against lawlessness and disorder.

3. Vessels of war of a belligerent shall not revictual nor take any stores in the canal except so far as may be strictly necessary; and the transit of such vessels through the canal shall be effected with the least possible delay in accordance with the regulations in force, and with only such intermission as may result from the necessities of the service.

Prizes shall be in all respects subject to the same rules as vessels of war of the belligerents.

4. No belligerent shall embark or disembark troops, munitions of war, or warlike materials in the canal, except in case of accidental hindrance of the transit, and in such case the transit shall be resumed with all possible dispatch.

5. The provisions of this Article shall apply to waters adjacent to the canal, within 3 marine miles of either end. Vessels of war of a belligerent shall not remain in such waters longer than twenty-four hours at any one time, except in case of distress, and in such case, shall depart as soon as possible; but a vessel of war of one belligerent shall not depart within twenty-four hours from the departure of a vessel of war of the other belligerent.

6. The plant, establishments, buildings, and all works necessary to the construction, maintenance, and operation of the canal shall be deemed to be part thereof, for the purposes of this Treaty, and in time of war, as in time of peace, shall enjoy complete immunity from attack or injury by belligerents, and from acts calculated to impair their usefulness as part of the canal.

public of Panama, November 18, 1903. In this treaty, by which the United States obtained the territorial concession and the rights required for the construction of the canal, the United States agreed, in Article XVIII:

> The canal, when constructed, and the entrances thereto, shall be neutral in perpetuity, and shall be opened upon the terms provided for by Section I of Article 3 of, and in conformity with all the stipulations of, the treaty entered into by the Governments of the United States and Great Britain on November 18, 1901.

By these treaties and as a consequence of the policy to which the United States will adhere in carrying out their terms, European and other countries are assured of the use of the Panama Canal on terms of entire equality and without special discriminations being made in favor of the citizens of the United States. The citizens and subjects of all nations are guaranteed the right to use the canal on the same terms as the citizens of the United States use the waterway. This gives foreign countries full opportunity to derive from the canal all the benefits to their industry and commerce that can be secured from reductions in the costs of transportation and from the use of safer and shorter ocean routes. The interest of foreign countries in the Panama Canal are as great as the possibilities of the ad-

vantageous use that "vessels of commerce and of war" may make of a waterway that has been opened as a world highway which all nations at peace with the United States may travel so long as they observe the rules of neutrality that the United States has formulated and, by solemn treaties, has obligated itself to enforce and observe.

CHAPTER X

COMPETITION OF THE SUEZ AND PANAMA ROUTES

The question is often asked: To what extent and with what success will the Panama Canal compete with the Suez Canal? The construction of a waterway across the American Isthmus has made it possible for the countries on both sides of the Atlantic to choose between a western and an eastern gateway of approach to the Pacific. To what extent will the routes through these two gateways be alternative and competitive in the actual conduct of the world's commerce, and in what measure, if at all, may the canals at Suez and Panama be of complementary service to international trade?

Before the Panama Canal was opened, the commerce between the eastern seaboard of the United States and the Pacific shores of Asia was shipped either directly via Suez or indirectly via Europe whence it was sent to the Orient by the Suez route. Of course, practically all of Europe's trade with the Far East, except that carried over the Trans-Siberian Railroad, made use of the Suez Canal, and so did all the passenger steamers

and some of the freight vessels operated between Europe and Australia and New Zealand. In the future, the commerce between the eastern part of the United States and transpacific countries—save such minor share of the trade of America with the Orient as may leave or enter the United States via Pacific ports and be transported across the country by the transcontinental railroads—will move via Panama; and it may come to pass that some of the trade of northwestern Europe with Japan, northern China, and Siberia will prefer the Panama route.

The Panama Canal at once caused the shifting of some traffic from the Suez route to the new waterway, and it is probable that the future development of transpacific countries will create commerce that would have used the Suez Canal had not a waterway been constructed across the American Isthmus. The nature of the competition between the Panama and Suez canals and the probable effects of their rivalry both upon the traffic of the two waterways and upon the commercial advantages of the sections of the world where the traffic territory of one canal joins or overlaps the field from which the other canal draws its traffic will be made clearer by a statement of the factors that will determine the routes vessels may be expected to take in trafficking between the eastern seaboard of the

United States and transpacific countries and between Europe and the Far East.

Three main considerations may influence the master or owner of a vessel in deciding which one of two or more alternative routes shall be taken to reach a distant port—relative distances, opportunities to trade en route at intermediate ports, and the cost of fuel by each of the possible routes. In addition to these major factors, other minor considerations may have some influence. One route may be safer than another and the insurance rates lower. One route may run through the Tropics where the excessive heat puts a hard strain on the engine-room force and may injure the cargo, while the alternative course may lie mainly in the temperate latitudes where the crew will be comfortable and the cargo free from risk of deterioration. By one route the vessel may sail with winds and currents, while by another course the ship must breast winds and opposing currents. In the days of sailing vessels, the course taken was determined largely by wind and weather and the direction of the ocean's flow, but now the forces of the air and sea, while they may modify, can seldom control the route followed by the large engine-driven craft that carry the world's sea-borne commerce.

In discussions of the effect of the Panama Canal upon ocean routes, the factors other than distance

that influence the movements of vessels are sometimes neglected, it being assumed that the route shortest in distance and time of voyage between the ports of clearance and ultimate destination is the best one to take. As a matter of fact, the shorter route may be the less profitable, or the more expensive one, to follow.

The shorter route will be less profitable than the longer one if by taking the less direct course the vessel can deliver and take on cargo at several ports on the way. If a ship clears from home or the starting port with a full cargo for the port of ultimate destination, the master will have no interest in traffic at intermediate points; but nearly all vessels that are run in line services and many vessels operated under charters must take freight for several destinations in order to secure cargo of such tonnage and variety as will give the vessel a full or satisfactory lading. Ships must move in and with the currents of traffic and not by short cuts, unless, as is true of the minor share of clearances, the vessel sets out on its voyage laden with a cargo for a single destination.

The shorter of two possible routes may be made the more expensive one by the higher price of fuel that must be purchased on the way to the destination. The two large items of the cost of operating vessels are fuel and wages; and, even

in the case of a freight vessel that burns only 40 or 50 tons of coal daily, a difference of one to two dollars a ton in the cost of coal may amount to several thousand dollars during a round-trip voyage between a port in Europe or the United States and a port in Chile, Australia, or Japan. The cost of coal by routes through the Panama Canal will, fortunately, be lower than by most alternative routes. The effect of relative fuel costs by way of the Panama Canal and other routes has such an important bearing on the use of the canal by vessels plying between Europe and western South America, between Europe or the eastern United States and the Orient—particularly Japan, northern China and Siberia—that the facts regarding fuel supplies and fuel costs via the Panama Canal and alternative routes are reserved for special discussion in the following chapter.

The distances from the eastern seaboard of the United States to Japan, China, and the Philippines via Panama and via Suez, by way, in each case, of the intermediate ports at which calls are usually made, are given in some detail in Chapter III and are referred to briefly in Chapter IX in considering Europe's interest in the Panama Canal. Likewise the distances from Europe to the Orient and Australia by way of Suez and Panama have been set forth; and, upon Map 4,

on page 41, has been charted the line connecting points equally distant from Liverpool via Suez and Panama, the line through places the same distance from Liverpool via Suez as from New York via Panama, and the line showing points equally far from New York via Suez and via Panama. This map indicates the regions which, in so far as distances are controlling, are within the traffic zones of each canal.

If relative distances alone determined the routes taken by vessels, the commerce of New York and of the other north Atlantic ports of the United States with China north of Hongkong would all be carried on by way of Panama. The same would be true of the trade with Australia; while the trade with the East Indies and Indo-China would be handled by way of Suez, and the commerce with Hongkong and the Philippines, places equally distant from New York by either canal, would be divided between the Panama and Suez routes. New Orleans and the Gulf ports, as compared with New York and the north Atlantic ports, being nearer Panama and farther from Suez, are about 2,000 miles nearer Hongkong and Manila by way of Panama, and are approximately the same distance from Singapore and the East Indies by either canal route. By the same token, the commerce of all of Europe with the Pacific shores of Asia, the Philippines, the East Indies,

and Australia would make use of the Suez Canal (and the route around the Cape of Good Hope for freight traffic between northwestern Europe and Australia), the line connecting points equally distant from Liverpool via Suez and Panama running to the east of Australia and the larger part of Japan.

The zones from which the Panama and Suez canals will draw traffic are, of course, not bounded by the lines connecting points equally distant from Atlantic ports via the opposing canal routes. The zones will overlap, and vessels sailing where desired traffic is to be secured and following, when possible, the ocean routes along which fuel is cheapest will often add to their sailing log in order to increase earnings or to decrease operating expenses. In the section from Singapore to Yokohama, especially, will there be an interlacing of the routes taken by vessels using the Panama and Suez canals, and in a less degree the Philippines and Australia will be within the traffic territory of both the Panama and Suez canals.

Vessels outbound from Europe to China and Japan may find it desirable to return to Europe by way of Vancouver, or San Francisco and the Panama Canal; and, similarly, vessels going from New York via the Panama Canal to Japan, China, and the Philippines, may add to the earnings of their voyages by proceeding to Singapore, from

which point their better course may either be to go on via India, the Suez Canal and Europe, or to return over the outbound route through the Panama Canal. Likewise vessels sailing from the United States to Australia via the shorter route through the Panama Canal may, on account of Australia's large exports to Europe, find that more cargo and better earnings are to be had by returning to the United States via the Cape of Good Hope or the Suez Canal and thence via some British or other European port. As stated above, vessels will follow the main currents of traffic as much as possible. The longest way around may be the most profitable, if not the shortest, way home.

In view of the facts just stated it is evident that it is difficult to determine closely the extent of the competition of the Suez and Panama canals for the commerce of the Orient and Australia. In 1911, as the prospective completion of the Panama Canal was drawing near, an investigation was made by M. Claude Casimir-Perier for the Suez Canal Company "to ascertain to what extent the opening of this new route will affect the business of the Suez Canal." The report contains a brief analysis of the trade then carried on via the Suez Canal between the Atlantic seaboard of the United States and India, the East Indies, the Philippines, China, and Japan, and also of the

trade of Europe, through the Suez Canal, with Asiatic ports and Oceania.

The conclusion reached by M. Casimir-Perier was that the trade of the Philippines with the eastern part of the United States would be diverted to the Panama route, and that vessels carrying full cargoes from the eastern seaboard of the United States to Japan and China would make the run via Panama, but that only a part of the vessels taking mixed cargoes, manufactures, and merchandise from the Atlantic ports of the United States to Japan and China would choose the Panama route. Similarly, it was concluded that the relatively small tonnage of exports from Japan and China to the eastern seaboard of the United States would be taken by way of Suez in order to enable the lines running out to Japan and China to secure the relatively heavy tonnage afforded by the exports of the East Indies and India.

As regards the effect of the Panama Canal upon the trade of Europe with Asiatic ports and Oceania by way of Suez the report states:

> It does not seem likely that any considerable amount of freight between Europe and ports beyond Suez will be diverted by the opening of the Panama Canal. It is to be feared, though, that one of the results of the opening of this new route will be the attendant competition, and possibly a newborn trade, between the eastern States of America and the Far East and Oceania.

The general conclusions reached by M. Casimir-Perier as to the loss of traffic which the Suez Canal would experience and as to the effect of the Panama Canal upon the competition of the United States with Europe for the trade of the Far East were:

> It is hardly likely that the loss will amount to over 300,000 tons, not such a large figure in comparison with the 16,500,000 tons of business of the Suez Canal during the past year [1910].
>
> On the other hand, the trade of Europe with the Far East via Suez will be slightly reduced by American competition, which will, perforce, have to be met; there will be some compensation, however, in the stimulation business generally will receive, and which never fails to follow the opening of new and fresh lines of communication.

The volume of tonnage diverted from the Suez route to the Panama Canal will probably be larger than 300,000 tons. Mr. Casimir-Perier's prediction that the general or mixed cargo traffic between the Atlantic ports of the United States and Japan and China will be carried via Suez will probably prove to have been a mistake. It is, of course, too early to reason on the basis of experience. The conditions created by the European War that has been in progress ever since the opening of the Panama Canal have prevented the normal working of commercial forces; and one

cannot reason solely with reference to what the movements of commerce have been since the operation of the Panama Canal began. It was several months after the war commenced, however, before the Mediterranean Sea and the Suez route were brought within the theatre of military operations.

The trade between the eastern seaboard of the United States and the Far East, as a matter of fact, has for the most part been by way of Panama; and there are strong reasons for thinking Panama the normal commercial route for that trade. The Panama route is shorter. It enables a vessel to take traffic to the Orient from the eastern seaboard of the United States and also from the western coast of North America, and to bring imports from the Far East both to the Pacific ports of the United States and to those on the Atlantic seaboard. If the vessels employed in the trade between the Atlantic ports of the United States and the Orient are under the American flag, they may also engage in the intercoastal trade, westbound and eastbound, to the extent that it may be profitable for them to combine the coastwise and foreign trade. Moreover, a part of the commerce of New York and other eastern American ports with the Orient is carried between the two seaboards by coastwise vessels, some goods being transshipped at Pacific ports

and carried between the Pacific coast of the United States and the Orient by lines operated back and forth across the north Pacific.

The diversion from the Suez to the Panama route of practically all of the traffic between the United States and the Far East is made the more certain by the fact that Japan is interested in the direct trade between the Orient and the United States via the Panama Canal. A Japanese steamship line, with the support of the Government, has inaugurated via Panama a service between Japan and New York, the traffic handled by this line including not only Japan's exports and imports, but also a part of the trade of China with the United States. Although it is to be expected that some goods will move from the eastern seaboard of the United States to the Orient via Europe and the Suez Canal, and although it is probable that vessels will from time to time be dispatched from New York to the Far East via the Suez Canal when that route again becomes safe, it seems reasonably certain that such shipments will be exceptional and will constitute a relatively small share of the total foreign trade between the eastern part of the United States and countries beyond the Pacific.

During the thirteen months that the Panama Canal was in operation before it was temporarily closed by the Culebra slides, 154 vessels carry-

ing 994,370 tons of cargo passed through the canal en route from the Atlantic ports of the United States to countries beyond the Pacific. The traffic in the opposite direction was much less, there being but 32 vessels and 201,295 tons of cargo that passed through the canal directly from the Far East and Australia to the eastern seaboard of the United States. As the published tabulation combines the traffic of all transpacific countries, the tonnage of the traffic with the Far East—China, Japan, and Siberia—is not stated. The commerce with transpacific countries, as with other parts of the world, has of course been abnormal during the war, among other irregularities being the shipments of war supplies to Vladivostok, a port from which there is but little cargo to be secured for carriage to the United States. Ordinarily the exports from the United States to Japan and China are more bulky than the imports from those countries; and the war has increased the discrepancy between the westbound and eastbound tonnage movement across the Pacific.

Incidentally it is interesting to inquire where the vessels taking cargo from the United States across the Pacific go after sailing from the Orient. It is evident that only the minor share of the vessels return directly from the Far East via Panama to the Atlantic. Do most of the vessels go on via Asiatic ports and return by way of Suez

or the Cape of Good Hope, or do they return in ballast or partly loaded across the Pacific? Some doubtless proceed via Asiatic ports, but apparently many return across the Pacific. An indication, though not a proof, of this is to be found in the fact that the number of vessels passing through the canal from the west coast of Canada and the United States to Europe during the period in question was 131, while the number from Europe to the west coast of the United States and Canada was only 45. Likewise the number of vessels passing through the canal en route from Central and South America to the United States and also to Europe were much in excess of the number in the opposite direction; and, while it is known that some vessels approach the western coast of South America by way of the Straits of Magellan and return to the Atlantic via Panama, it is also known that vessels cross the Pacific from Australia and the Orient to South America where abundant cargo is obtainable.

In the *Canal Record* of March 24, 1915, the following note appeared:

> The steamship *Indra,* passing through the canal on March 13, was the fifth vessel to make the canal transit in direct routing from the Far East to the Atlantic coast of the United States. Most of the 16 vessels which have made the outward voyage over this route have subsequently taken various tramp assignments; some

have returned through the canal with grain from the west coast of North America for Europe.[1]

Chartered vessels, or "tramps" as they are termed, do not, as do vessels forming a line, sail back and forth over fixed routes; but follow such routes as will enable them to secure freight in largest quantity and at the best rates; it is partly because of the irregularity of the movements of these carriers of heavy cargo that it is impossible to fix definitely the boundaries of the regions whose commerce will use the Panama Canal and to locate the limits of the regions whose trade will prefer the Suez route. The canals at Suez and Panama have removed the barriers to the direct round-the-world movement of vessels; and ships, being now able to pass readily either by an easterly or a westerly course between the north Pacific and the north Atlantic, are thus freer than they once were to follow the currents of traffic. Vessels having taken cargo, under charters, to the Far East, either from the eastern United States by way of Panama or from Europe

[1] The nature of the imports into the United States from China, Japan and the Philippines is well shown by the cargo of the *Indra* which loaded at Shanghai, Hongkong, Manila, Kobe, and Yokohama. The cargo included beans, rice, copra, manufactured goods, copper and tin ingots, vegetable and cotton seed oils, manganese, skins and hides, tea, cotton, hemp, silk waste, wool, curios, mattings and rattans, bamboo, vegetable tallow and antimony.

via Suez, can now return via the west coast of Canada and the United States and by way of the Panama Canal, if, as may often occur, there is better prospect of securing profitable cargo by that route than by way of Asiatic ports and the Suez Canal.

The Panama and Suez Canals are to be regarded as supplementary routes quite as much as they are to be considered as competitive rivals. With both canals in service, the countries on both sides of the Pacific Ocean will develop more rapidly and the commerce of Europe and of the United States with those countries will increase faster. This acceleration of industrial progress and of international trade may readily cause the future traffic of the Suez Canal to be larger than it would have been had the Panama waterway not been constructed. It is more than probable that the two canals will be helpful to each other as well as of assistance to the commerce of rival sections of the world. As has often proven true in the past of other competitive transportation routes, each, by serving all, may prosper and grow stronger because of the assistance it renders.

CHAPTER XI

FUEL SUPPLIES AND COSTS VIA THE PANAMA CANAL AND ALTERNATIVE ROUTES

Freight vessels of medium size, when operated at 9 to 12 knots which is the average speed of such ships, consume from 30 to 50 tons of coal per day. The two largest items of "expenses at sea" are for wages and fuel, and the fuel costs are often greater than the payments for wages. It is thus obvious that, if there be much difference in the price of coal at stations along two alternative ocean routes leading to a distant port, the route along which coal is cheaper will have an advantage in the competition for traffic. A difference of $2.50 to $3 per ton in the cost of coal means an addition or saving of $100 per day in the running expenses of an ordinary freight steamer.

There are wide differences in the price of coal in different parts of the world. In the normal times that preceded the outbreak of the European War, good steaming coal cost about $3.50 per ton at New York, $3 at Norfolk, $4 to $4.50 at Cardiff, $3.50 at Durban in Natal, at Sydney, Australia, or at Nagasaki, Japan; while the price at

San Francisco was about $7, at Buenos Aires $8 to $9, and at stations in the Pacific Ocean remote from sources of supply $10 to $12 per ton.

A vessel sailing from the eastern seaboard of the United States or from northwestern Europe for a Pacific port of America or for Australia or China may secure good coal at low prices at the port of departure; but if a vessel takes on more coal than is required for a run of 20 to 30 days it is obliged to use for bunkers much space that might be occupied with paying cargo; and it is often more profitable for a vessel to purchase coal at stations en route at relatively high prices than to start with coal enough to make the entire outbound run; while it is seldom best for a vessel to start from an Atlantic port of the United States or Europe with coal for a round trip to an American or Asiatic Pacific port. Most freight vessels making long runs buy coal at more than one station along the route followed, in order thereby to keep the space occupied by fuel at a minimum and the space available for cargo at a maximum.

Line vessels making regular runs over long routes that connect ports at which coal is relatively high and oil is relatively cheap may find it more economical to use oil instead of coal in the furnaces. Moreover, it often happens that vessels make regular round trips starting from a

port where coal or oil is cheap and running to a port where coal or oil is expensive. In that case it is desirable to start with fuel enough for the outbound and return trip, if that can be done without unduly limiting the space for paying cargo. Coal and oil being relatively inexpensive at New York and exceptionally high-priced at the ports of South America, a vessel leaving New York for the east coast of South America or for the west coast of South America via the Straits of Magellan would, if having oil-burning engines, probably start with fuel for the round trip. If the vessel has coal-burning engines, it will start with as much coal as it can take without much restricting the tonnage of freight in its lading. An oil-burning vessel plying between San Francisco and Yokohama will, if practicable, take on fuel oil at San Francisco for the round trip. Coal being cheap in Japan, some vessels have been equipped to burn oil westbound across the Pacific and coal on the eastbound run.

Coal is not only more bulky than an equivalent amount of fuel in the form of oil, but must be carried in bunkers near the boiler room, whereas fuel oil can be carried not only in deep tanks near the boilers but also in double-bottom spaces and in peak tanks at the bow of the ship; that is, in spaces not available for the stowage of cargo. Vessels equipped with oil-burning engines can

take on fuel for long runs without greatly reducing the space for cargo, and often without greatly lessening the number of tons of freight that a vessel can carry, unless the vessel is laden with heavy freight, in which case the deep load line may be reached before the space for cargo is fully occupied and thus the amount of fuel on board, whether coal or oil and whether carried in bunkers, deep tanks, peak tanks, or in double-bottom spaces, will affect the tonnage of cargo that may be transported. In general, bulk carriers, and they comprise the majority of ocean freighters, avoid taking on large quantities of fuel, in order to reserve the maximum share of the ship's buoyancy for the transportation of paying freight.

One important economy effected by the opening of the Panama Canal results from the establishment of stations at Cristobal and Balboa at which coal and oil, brought from the United States, are sold at relatively low prices. Before the opening of the canal, the routes from the eastern United States and from Europe to the Pacific ports of North and South America were not only longer than they now are, but they led to destinations where coal and oil (with the exception of oil in stations near the California fields) were expensive. The Panama Canal has shortened these routes, and midway along shortened routes coal

and oil may be obtained at Cristobal or Balboa at prices much below the cost of fuel in most of the ports of the Pacific coast of South or North America.

The use of oil instead of coal as the fuel for marine engines is increasing, although there is no present prospect that oil-burning engines are to be generally substituted for coal-consuming engines. For some time to come, at least, and possibly for an indefinite period, the majority of ocean vessels will use coal for fuel. The relative prices of coal at stations along alternative routes will continue to influence the choice of routes taken by the larger share of the carriers of ocean freight.

Two types of oil-consuming marine engines are in use. One is a steam engine that uses oil instead of coal to generate steam; the other type is the Diesel engine that has no furnaces and boilers. In the Diesel engine the oil in the form of a fine spray is injected into the cylinders under pressure, and, being there ignited by the heat due to the cylinder pressure, burns and forms the gases whose expansion creates the force that drives the piston. The Diesel engine is similar in principle to the gas engine except that in the gas engine the fuel enters the cylinder as gas and there explodes, whereas in the Diesel engine the fuel enters the cylinder as a spray of oil which

burns in the cylinder. The gas engine is an internal explosion engine, the Diesel engine an internal combustion engine.[1]

Both the oil-burning steam engine and the Diesel engine are being used in increasing numbers on ocean vessels. Which of these two types of marine engines will ultimately find greater favor it would be rash to predict. The Diesel engine is theoretically of technical superiority; and, if certain present difficulties in operation are successfully overcome, the Diesel engine may come into general use on ocean vessels; but until very recently the tendency has been to install oil-burning steam engines rather than Diesel engines in such vessels as are equipped with other than coal-burning engines. However, the Diesel engine is apparently increasing in favor, and it may, in the near future, prove to be preferable to other types of marine engines.

The Panama Canal is comparatively near the productive coal and oil fields of the United States from which high-grade fuel in large quantity can be economically obtained. Good steaming coal from the Alabama fields can be shipped to the canal from the Gulf ports, and coal of still higher

[1] For a description of the Diesel engine and of the several kinds of oil and gas engines used in ocean vessels, consult Chapter X of the writer's *Report on the Measurement of Vessels for the Panama Canal.*

quality from the Pennsylvania and West Virginia fields is sold in unlimited quantity at Norfolk, Baltimore, Philadelphia, and New York. The best steaming coal to be had in the United States comes from the Georges Creek, New River, and Pocahontas fields in West Virginia and Maryland, and this coal, the heating efficiency of which is only 5 per cent. less than that of the best Welsh coal, can be sold at Norfolk at $3 per ton and has sold at that figure or less in the past. It is probable that future prices may range somewhat above the prices that have prevailed in the past, but this will hardly have much effect upon the relative costs of coal at points of production or ports of original shipment, for the reason that the forces that may bring about higher prices will doubtless be world-wide in their operation.

From the oil fields of Texas and California the fuel stations at Cristobal and Balboa can be supplied with oil at low cost, both because of the low prices at the points of production and because of the favorable freight rates from Texas or southern California to the canal. Thus far the fuel oil sold at the Isthmus has come mainly from southern California where such oil is secured at exceptionally low costs.

The coal used at Panama has come mainly from Norfolk, and has been transported principally by bulk carriers which have sometimes been vessels

chartered by the companies from which the coal was purchased, and sometimes have been colliers operated by the Panama Rail Road, that is, by the United States. When shipping is abundant the rates are low. It would seem probable that in the future the vessels that transport iron ore and nitrate from Chile to the United States will find it profitable to carry coal from the eastern seaboard of the United States to Panama at rates somewhat less than need be charged by vessels employed primarily in the transportation of coal to the canal.

The price of coal at Panama can be less than at Suez for two reasons. The cost of coal at Norfolk and other points of shipment from the United States has averaged fully a dollar per ton less than the cost at British and Welsh ports, and the freight rates from the United States to the Panama Canal are lower than the freight charges from Great Britain to the coaling stations in the Mediterranean and at the Suez Canal. Vessels outbound from Great Britain for the Mediterranean and places beyond the Suez Canal have abundant cargo and do not need to take coal or other bulk traffic at low rates. Coal has to pay regular freight rates from the English Channel and the North Sea to the Suez Canal; whereas the shippers of coal from the eastern seaboard of the United States to Panama ought to be able to

secure favorable rates because the tonnage of freight from western South America and from Hawaii to the United States is greater than the tonnage in the opposite direction. When normal conditions of commerce and shipping have been restored, it is probable that bulk carriers from the eastern United States to western South America will be willing to take coal to the Isthmus at low rates.

Coaling stations have been located along all the traveled ocean highways to supply fuel to merchant vessels; and for the purpose of providing warships with coal, stations are maintained at some remote points seldom visited by merchant carriers. The location of the principal coaling stations of the world is indicated by Map 7.

One finds from the map, as one would expect to find, that the coaling stations are numerous and close together along the seaboard of Europe and of the eastern part of the United States. In other parts of the world the stations are farther apart, being maintained only at places where the demand of merchant vessels or warships for fuel is sufficient to justify private companies or individuals in keeping coal in stock.

The coaling stations located in different parts of the world are maintained by the large coal-mining and coal-shipping companies of Great Britain, and to a lesser extent by similar companies in

the countries of continental Europe and in the United States. Some of the largest steamship companies maintain coaling stations at the Suez Canal, or in the West Indies, or at other points where the steamship company's vessels make regular and frequent calls. Practically all of the maritime powers of the world have supplies of coal at their naval bases, and these naval bases, as is well known, are, in the case of a maritime power such as Great Britain, to be found in many parts of the world. For the most part, however, the coaling stations of the world are maintained by coal companies as mercantile enterprises.

The British and other companies that maintain the coaling stations along the routes of ocean commerce sell coal to regular steamship lines at prices fixed by annual contracts. The coal company undertakes to supply the owners of vessels with all the bunker coal required and at rates somewhat below the current charges made for coal that may be bought by the occasional buyer. These annual agreements, also, usually provide that "should the current general price for equal quality of coal be lower at the time of coaling, the steamer is to receive the benefit of such lower price." The owners of the steamship lines agree on their part to make all their purchases from the dealers with whom they are under contract. Such vessels, not connected with regular lines,

as may purchase coal at stations en route pay the current market price charged for coal at the stations from which the fuel is purchased.

The prices charged for coal at any particular station will naturally depend, first of all, upon the nearness or remoteness of the station from the mine from which the fuel is obtained. Prices will also necessarily depend upon whether the ocean freight rates from the source of supply to the station are high or low. The English coaling companies have been able to establish and maintain most of the coaling stations in different parts of the world because of the abundance of shipping and of the low freight rates from England to different quarters of the globe. The opening of the Panama Canal and the consequent large movement of vessels lightly laden from the eastern seaboard of the United States to western South America may result in American coal companies maintaining coaling stations along the Panama routes.

The stations along the Suez route obtain coal mainly from Wales, England, and Scotland, Welsh coal being most largely sold. The prices are relatively high at the Suez Canal, and higher south and east of the canal. The coal prices along the Suez route do not rise strictly with the increase in distance from Great Britain, but the advance in cost is roughly in accordance with

distance until stations are reached at which Japanese and East Indian coal can successfully compete with Cardiff or Durham coals. At Colombo, Welsh coal must compete with that from India and Australia; at Sabang with Indian, Sumatran, and Japanese coal; and at Singapore with Japanese, Indian, Australian, Labuan, and Natal coal. Beyond Colombo and Singapore, Welsh coal is unimportant and Japanese and Chinese coals predominate. In Australia native Newcastle and Southern Australian coals supply the demand; in New Zealand both native and Australian (Newcastle) coals are sold; in South Africa the Natal mines are the source of supply; on the lower west coast of South America coal is secured at Coronel; on the Pacific coast of North America, British Columbian and Washington coals are used; and at stations in the West Indies and on the eastern seaboard of the United States the excellent coal from Pennsylvania, West Virginia, and Alabama is obtainable.

At the larger coaling stations located upon the map, fuel oil is now to be obtained. The number of points at which oil can be secured is by no means so numerous as the number of coaling stations, but supplies of oil are being provided at an increasing number of stations. At stations where oil can be obtained, more often it is crude petroleum which oil-burning steam engines use

for fuel. At a limited number of stations the heavier oils best adapted to use in Diesel engines can be purchased. Diesel oil is sold at the Panama Canal, and at an increasing number of other points this oil is kept in stock for sale to meet the growing demand for this kind of fuel.

Coaling stations with large capacity have been established at the Panama Canal. The coaling plant at the Atlantic entrance of the canal has a capacity of about 400,000 tons, and the plant at the Pacific entrance a capacity of 200,000 tons. Both stations are equipped with unloading and loading cranes, and are supplied with lighters for use in coaling such vessels as do not find it convenient to tie up alongside the wharves at the coaling stations. During the six months from September 1915 to February 1916, inclusive, there were 138,480 tons of coal handled by the Panama Canal Administration at the Colon and Balboa stations. During this period the canal was closed to traffic and for the last three months of this period the sales of coal were exceptionally light. Prior to the temporary closing of the canal in September 1915, the aggregate sales of bunker coal to vessels averaged about 30,000 tons a month at Colon, while at Balboa, where the price of coal is $1 per ton higher than at Colon, the sales averaged about 4,000 tons per month. These sales are naturally but a fraction of what the sales will be

in the future when, with the restoration of peace in Europe and the return of commerce to its normal proportions, the traffic through the canal becomes of normal volume.

The Government has established facilities for the storage of large quantities of crude petroleum and gasoline for sale to merchant vessels and war ships. For the storage of gasoline, there is at Balboa a tank with a capacity of 200,000 gallons, and at Mt. Hope a tank with the same capacity. In addition to the supplies kept at the Isthmus by the canal administration, there are the supplies maintained by the Union Oil Company of California, the Panama Agencies Company, and the Huasteca Oil Company. The last named company's tanks are at the Atlantic entrance, while those of the other companies are at Balboa.

The present price of coal at Panama is abnormally high, although the increase of price at Cristobal and Balboa has been relatively small as compared with increases at most of the world's coaling stations. Scarcity of shipping and the consequent high ocean rates and the abnormal demand of the British navy for Welsh and English coal has established "war prices" for coal in most parts of the world.

Prior to the first of September 1915, the United States, through the canal administration, sold coal to all buyers for $5.40 per ton at Cris-

tobal and for $6.40 per ton at Balboa. Since that date the prices have been $6 per ton at Cristobal and $7 at Balboa. These are the prices charged for coal trimmed in the bunkers when the ship uses her own hoisting engines. When the canal authorities provide a hoisting engine, a small charge of $1 per hour is made for the use of the engine. The price at Balboa is higher than at Cristobal because of canal tolls and other expenses. The coal delivered at both the Pacific and the Atlantic ends of the canal is brought from the Atlantic ports of the United States.

The advantages of routes via the Panama Canal as compared with alternative competitive routes, in the matter of relative expenses for coal, can best be shown by comparing the prices of coal at a few important stations along different routes. It would, however, be misleading to compare prices prevailing at the present time. If the prices that prevailed before the opening of the canal—that is, if the contract prices for the year 1912 or the year 1913 are taken—the relative costs of fuel by alternative routes will be accurately shown. It is probable that prices after the close of the present European War will range higher than the prices that prevailed before the war, but the relation of prices at different stations will probably be much the same in the future as they have been in the past. If anything, the ad-

vantages which the Panama routes had before the war, as regards relative coal prices, were less than the advantages will be after the prices of coal have again reached a normal level. That is to say, the war will probably place Welsh and English coal, with which the coal stations of the world are mainly supplied, upon a permanently higher level; whereas the effect of the European War will be but slight upon the cost and price of American coal with which stations at and beyond the Panama Canal will be mainly stocked.

In 1912 the price for Welsh coal at Port Said was 26*s.* per ton, or nearly $1 more than the price of $5.40 charged at Cristobal during the first year of the operation of the Panama Canal. As stated above, the price of coal at Balboa is $1 per ton higher than at Cristobal, but at the Suez Canal the difference in the price at the two ends of the canal is much greater. The 1912 price at Suez—that is, at the Red Sea end of the canal—was 36*s.*, or nearly $2.50 more than the charge at Port Said.[1] This high price of coal at Suez is apparently due in part to the absence of competition.

[1] For information concerning the 1912 prices of coal at the leading coaling stations of the world, consult Chapter X of the writer's report on *Panama Canal Traffic and Tolls.* Consult also A. W. Kirkaldy's *British Shipping: Its History, Organisation and Importance,* Appendix XI, pp. 602-610. Kirkaldy's table is especially comprehensive and quotes prices which are stated to be "extracted from actual contracts."

The same Welsh coal sold for 34*s.* at Aden and at Colombo, and for 35*s.* at Singapore. At Colombo, Welsh coal competes with Australian, Indian, and Japanese coal.

Table 3, taken from the report on *Panama Canal Traffic and Tolls*, states the prices of different kinds of coal at a limited number of coaling stations along the Panama, Suez, Cape of Good Hope and Straits of Magellan routes:

TABLE 3

Contract Prices of Coal in 1912 at Selected Stations in Different Parts of the World

Station	Kind of Coal	Price per Ton 1912	Delivered
Southampton[1]	Welsh	25s. 3d.	Trimmed
Havre[2]	Welsh	21s. to 24s.	Trimmed
Gibraltar[2]	Welsh	22s. to 24s.	F. O. B.
Algiers	Welsh	22s. 6d.	F. O. B.
Port Said	Welsh	25s. 6d. to 26s.	F. O. B.
Colombo	Welsh	34s.	Trimmed
	Bengal	21s. 6d.	Trimmed
	Natal	25s. 6d.	Trimmed
Singapore	Welsh	35s.	F. O. B.
	Australian	24s. to 25s.	F. O. B.
	Japanese	22s. 6d.	F. O. B.
Moji	Good Japan lump	14s.	Trimmed
	Good Japan run-of-mine	12s. 6d.	Trimmed
Yokohama	Yubari lump	18s. 6d.	Trimmed
	Yubari run-of-mine	17s.	Trimmed
Durban (Natal)	Natal	12s. to 14s. 6d.	F. A. S.
Sydney (New South Wales)[1]	Southern screened	16s.	Trimmed
Melbourne[1]	Newcastle and Southern	19s. 6d.	F. A. S.
Coronel, Chile	Chilean	24s. 6d.	Trimmed
Valparaiso[1]	Welsh (Admiralty)	61s. 9d.	F. O. B.
Montevideo	Welsh (Admiralty)	43s.	F. O. B.
St. Lucia	New River and Pocahontas	23s.	Trimmed
Newport News and Norfolk	New River and Pocahontas	$3	F. O. B.
New York	Morrisdale and Clearfield	$3 to $3.25	F. A. S.
Comax or Union, British Columbia	Best Comax lump	$5	Trimmed
Seattle	Carbon Hill steam	$4.15	Trimmed

[1] Prices paid by United States Navy.
[2] Low price, "thro and thro"; high price, "large."

In comparing prices of coal of different kinds at different stations it is important to have in

mind the relative steaming value of various kinds of coal. West Virginia coal has about 95 per cent. of the heating value of Welsh coal and is somewhat better than Tyne, Durham, or other English coal. The efficiency of several kinds of coal is concretely, although not closely, indicated by statements made by the captains of vessels, who have had large experience with different kinds of coal. The captain of one vessel reports that his ship's daily consumption is 22 tons of best No. 1 Welsh, 25 tons of Tyne, 29 to 30 of Indian or Japanese, 24 to 25 of Newcastle (Australian), 30 of Chilean, 24 to 25 of New River (West Virginian), and 26 of Alabama coal. Another vessel is reported by its captain to have a daily consumption of 25 tons of best Welsh as compared with 26½ tons of Pocahontas, 26 Welsh run-of-mine, 28 of Lancashire or Tyne, and 30 of Indian or Japanese coal. Pocahontas coal is particularly effective in vessels with forced draft, in which class of vessels its steam value is about equal to that of Welsh coal.

The prices of different kinds of coal sold at the same station vary roughly according to the relative steaming qualities of the coal. At Singapore at least five different kinds of coal are sold. The coal is brought to Singapore from Australia, Japan, India, and Wales. The 1912 contract price for coal at Singapore was: for Welsh 35*s.*; Aus-

tralian 24*s.*; Japan best 22*s.* 6*d.*; Deshergur (Indian) 21*s.* 6*d.*; and Bengal 19*s.* 6*d.* The price of Welsh coal at a point like Singapore is somewhat higher than its steaming value would justify, because warships insist upon Welsh coal whatever the price may be, and the charge made by dealers is thus somewhat higher than it would be if sales were made only to merchant vessels.

The facts presented in the preceding table as to the 1912 prices of coal at some of the leading stations in different parts of the world indicate in a general way the relative prices that were paid for fuel by vessels using the Panama, Suez, Cape of Good Hope and Straits of Magellan routes. Vessels leaving Great Britain for voyages via any of these four routes will start with as much coal as can be taken without unduly limiting cargo space. Vessels bound from northern Europe for the Orient via the Suez route will replenish their bunkers at a Mediterranean port, or at Port Said, for the long run to Colombo or Singapore. After making this long run, which is equal to the distance across the north Pacific, Australian and the cheaper, although inferior, coals from India or Japan can be obtained for the remainder of the run to the Orient. Japanese, Indian, or Australian coal is used for the return voyage to Port Said, where the bunkers are refilled for the run to the home port.

A ship making a voyage from a north European port to Australia via the Cape of Good Hope will probably start with coal enough for the run to Cape Town or Durban. At Durban coal can be obtained at a minimum price for the long run to Australia. At Australian ports coal can be obtained at a low price for the return to Durban, or for a run to Suez if that be the route taken. Vessels outbound from the United States for Oriental countries via the Suez Canal will start with fuel enough in the bunkers to enable the vessels to reach the Suez Canal where the bunkers will be refilled. Vessels sailing from the eastern seaboard of the United States for Australia via the Cape of Good Hope will, if cargo space permits, start with coal enough to reach Durban, but if the demands upon cargo space are large, less coal will be taken and the bunkers will be refilled at St. Vincent.

Vessels clearing from north European ports for the west coast of South America via the Straits of Magellan will, if possible, start with coal enough to reach Chile, the price of coal at stations on the east coast of South America being especially high. For the return trip from western South America to Europe via the Straits of Magellan, Chilean coal can be obtained at Coronel, but this coal is of low heating value and is sold at a relatively high price. Vessels returning from South

America to Europe via the Straits of Magellan will often purchase Welsh or English coal at Montevideo, paying therefor $10 or more per ton. The high price of coal in stations at the eastern ports of South America will unquestionably increase the use made of the Panama Canal by vessels engaged in the commerce between Europe and Chile.

Coal-burning steamers sailing from the United States through the Panama Canal, whatever may be the destination beyond, will start with coal enough to reach the canal; and, if the vessel starts with only a partial lading, it will set out with coal enough for the entire outward run to its port of destination on the west coast of South America, the United States, or Canada. If the vessel is bound for Australia or the Orient, it will purchase at Cristobal as much coal as its bunkers will hold in order to avoid paying the high prices charged for coal at the few mid-Pacific stations at which fuel can be obtained. Vessels returning from Australia or from the Orient to the Atlantic seaboard of the United States or to Europe via the Panama Canal will start back with an ample supply of Australian, Chinese or Japanese coal and refill their bunkers at the Panama Canal, or, possibly, in the case of English vessels, at a port in the West Indies.

The clearest expression of the relative costs of

coal via the Panama and alternative routes is the amount actually paid by vessels for coal in making trips over the routes in question. In 1911 a steamer of 4,640 tons gross and 2,927 tons net register, British measurement, operated at a speed of 10¼ knots and using 38 tons of coal per day, on the average, in making the round trip between New York and Manila via the Suez Canal, consumed 4,475 tons of coal, the cost of which was $20,868.75. The Panama Canal was not open at that time, but a calculation made by Major E. T. Wilson, then chief subsistence officer of the Isthmian Canal Commission, showed that the coal expenses which this vessel would have incurred in making the round trip between New York and Manila via a Panama Canal, San Francisco, Yokohama, and Moji would have been $18,222.50, or $2,646.25 less than the amount that was paid for coal in making the round trip via the Suez Canal.

The prices of coal in 1911 by all routes, including the price then prevailing at the Isthmus, were lower than in 1912. On the basis of 1912 prices and of an assumed charge of $5 per ton for coal at the Isthmus, this vessel's coal expenses for a round trip via the Suez Canal would have been $22,608.75, and by a Panama Canal $18,567, the expenses via Suez being $4,041.75 in excess of the expenses via a Panama route. Prices have

risen since 1912, and during 1914 the Isthmian Canal Commission charged $5.40 per ton for coal at Cristobal. Prices of coal at stations along the Suez route had unquestionably risen as much as along the Panama route, and there can hardly be any doubt that the relative advantages of the Panama route over one through the Suez Canal, as regards coal costs, were fully as great in 1914 as they had been in 1912.

In the report on *Panama Canal Traffic and Tolls,* to which references have been made in this chapter, calculations were made of the fuel expenses which the vessel referred to in the preceding paragraph would have incurred in making trips from New York to Adelaide, Australia, and return via the Panama Canal and via the Cape of Good Hope; and the calculations show that the fuel expenses via the Panama route would have been about $3,500 less than the expenses via the Cape. This would have nearly paid the tolls one way through the canal.

A similar calculation showed that the fuel expenses of a 10-knot steamer of 30 tons per day average coal consumption, while at sea, in making a round trip between Liverpool and Wellington, would have been about $8,470 less via the Panama Canal than via the Straits of Magellan, which, in this case, would be the alternative route. This exceptionally large difference in favor of

Panama as regards fuel costs was due to the high price of coal at the stations along the east coast of South America. The saving in coal bills in this instance would have been nearly enough to pay the Panama Canal tolls both ways.

As pointed out above, the high cost of coal at the ports on the east coast of South America make the fuel expenses very large for a trip from the east coast of the United States or from Europe to Chile by way of the Straits of Magellan. It was calculated, in the report above referred to, that a 10-knot freight steamer having an average consumption of 30 tons of coal per day would have spent, in 1912, $9,300 more for coal in making the round trip between Liverpool and Valparaiso via the Straits of Magellan than via the Panama route. The saving in fuel expenses would have been nearly equal to the amount of tolls which this vessel would have had to pay for passing through the Panama Canal on the outbound and return voyages.

What the differences in the cost of coal via the Panama and alternative routes will be in the future obviously cannot be stated; but, inasmuch as the advantages of the Panama route as regards fuel expenses can hardly be less and probably will be greater in the future than they have been in the past, the foregoing figures illustrative of the fuel economies made possible by the Panama

Canal may be accepted as indicative of the assistance which relative fuel costs will afford the Panama Canal in competing with alternative routes. The policy of the United States in administering the Panama Canal is, and doubtless will continue to be, to provide fuel and other supplies at the canal at cost, including overhead expenses. Fuel, supplies, and facilities will be furnished at the Isthmus by the United States without commercial profit in order that the canal may thereby be made as useful as possible to the commerce of the United States and the world in general.

CHAPTER XII

PANAMA CANAL TOLLS

Before the Panama Canal was opened an investigation was made to determine the best basis upon which tolls should be levied and to decide upon the proper rates of tolls to be charged. As a result of the investigation the following schedule of tolls to be paid by merchant vessels and warships was adopted and was established November 13, 1912, by proclamation of President Taft. The proclamation as officially published by the United States Department of State is reproduced upon the following page.

The tolls fixed by this proclamation were levied upon the ships using the canal and not upon the cargo or passengers carried by the ships. In the case of merchant vessels the tolls were levied upon their earning capacity. In the case of naval vessels the charges were imposed upon the weight or displacement of the vessel. The reasons why this basis of tolls was adopted and why the rates named were established can be made clear by a brief discussion of vessel and cargo tonnage and

By the President of the United States of America.

A Proclamation.

I, WILLIAM HOWARD TAFT, President of the United States of America, by virtue of the power and authority vested in me by the Act of Congress, approved August twenty-fourth, nineteen hundred and twelve, to provide for the opening, maintenance, protection and operation of the Panama Canal and the sanitation and government of the Canal Zone, do hereby prescribe and proclaim the following rates of toll to be paid by vessels using the Panama Canal:

1. On merchant vessels carrying passengers or cargo one dollar and twenty cents ($1.20) per net vessel ton—each one hundred (100) cubic feet—of actual earning capacity.

2. On vessels in ballast without passengers or cargo forty (40) percent less than the rate of tolls for vessels with passengers or cargo.

3. Upon naval vessels, other than transports, colliers, hospital ships and supply ships, fifty (50) cents per displacement ton.

4. Upon army and navy transports, colliers, hospital ships and supply ships one dollar and twenty cents ($1.20) per net ton, the vessels to be measured by the same rules as are employed in determining the net tonnage of merchant vessels.

The Secretary of War will prepare and prescribe such rules for the measurement of vessels and such regulations as may be necessary and proper to carry this proclamation into full force and effect.

In Witness Whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

[SEAL.]

DONE at the City of Washington this thirteenth day of November in the year of our Lord one thousand nine hundred and twelve and of the independence of the United States the one hundred and thirty-seventh.

WM H TAFT

By the President:

P C KNOX

Secretary of State.

of the effect of tolls upon the profitable use of the canal by merchant shipping.[1]

Canal tolls may be levied either upon the ships that use the waterway or upon the cargo and passengers carried by the vessels. If the tonnage of the ship, as distinct from the tonnage of what is in the vessel, be made the basis of the tolls, the charges may be imposed upon the ship's displacement, its gross tonnage, its net tonnage, or its dead-weight capacity. If the cargo in the ship is taken as the basis of tolls, the unit upon which the charges are imposed may be the long ton, the metric ton, or the measurement ton.

The "displacement tonnage" of a vessel is its weight in tons of 2,240 pounds and is equal to the weight of water displaced by the ship when floating. From the plans and drawings required for the construction of a vessel may be calculated the number of cubic feet of water which the ship will displace at any given draft. The weight of a cubic foot of sea water being 35 pounds, the displacement tonnage is readily determined. Displacement tonnage is used to designate the size of war vessels, but is not employed for merchant shipping except by shipbuilders.

A vessel ton is a purely arbitrary unit—100

[1] The subject matter of this chapter is discussed at length in the writer's report on *Panama Canal Traffic and Tolls*, and particularly in Chapters VII, XI and XII of that report.

cubic feet. The "gross tonnage" of a vessel is obtained by dividing by 100 the number of cubic feet of the entire closed-in capacity of the ship. A vessel has one ton "gross" for each 100 cubic feet of its entire closed-in capacity.

To determine the "net tonnage" of a vessel, there is ordinarily deducted from the entire closed-in capacity of the ship the space occupied by the crew, master's cabin, steering and anchor gear below deck, boatswain's stores, chart house, and spaces occupied by propelling power (engines, boilers, shaft tunnel, and coal bunkers). The Suez rules, however, do not make some of these deductions. The subtractions having been made, the net tonnage is ascertained by dividing the number of cubic feet in the remaining space by 100. In an up-to-date freight steamer, as measured by British, American, or German rules, the net tonnage is somewhat less than two-thirds the gross tonnage. In the case of a high-speed passenger vessel, such as the *Mauretania,* so much of the capacity of the ship is taken up with propelling machinery, fixed coal bunkers, crew spaces, etc., that the net tonnage may be less than half, sometimes not more than one-third of the gross tonnage.

The "dead-weight capacity" of a vessel is the number of tons of 2,240 pounds that the vessel is capable of carrying when loaded to its maximum

draft. Dead-weight capacity is a unit of frequent commercial usage. The number of tons dead-weight that a ship can carry at a designated draft is stated in the dead-weight scale which is shown on the vessel's plan, a copy of which is furnished to charterers when required. This scale shows the dead-weight capacity at various drafts from an empty to a full-laden vessel—a British vessel being fully laden when so loaded as to immerse the hull to the Plimsoll line which the British laws require to be painted on the outside of the hull. The payment for vessels chartered for a period of time is usually based upon dead-weight capacity; that is, time charter rates in most cases are a certain sum per dead-weight ton per month. The ratio of net tonnage to dead-weight capacity depends upon the types of vessel and upon the rules applied in the measurement of the ship. Ordinarily the dead-weight capacity is from 2¼ to 2¾ times the net tonnage.

The "cargo ton" is of two classes—weight and measurement. The weight ton employed in ocean commerce is either the English long ton of 2,240 pounds or the metric ton of 2,204.62 pounds. Countries having the metric system of weights and measures have the metric ton, while countries with the English system of weights and measures have the long ton. The English short ton of 2,000 pounds is used for most traffic by rail and

by inland waterways within the United States and to some extent for coastwise traffic between the two seaboards of the United States.

A large share of the cargo carried by ocean vessels is shipped not by weight but by measurement tonnage, 40 cubic feet being considered a ton. Grain, minerals, and some other articles regularly move by weight, but manufactures, general merchandise, and, in fact, most kinds of ocean freight are taken at "ship's option," weight or measurement, and the option taken is ordinarily measurement. It is said that 40 cubic feet was adopted as a measurement ton because a long ton of wheat occupies 40 cubic feet in the hold or berth of a ship. In the statistics of ocean freight both the long ton of 2,240 pounds and the measurement ton of 40 cubic feet are indiscriminately included; and thus it is not possible to ascertain from published statistics of ocean cargo tonnage the actual weight of traffic moved upon the high seas.

The Panama tolls upon merchant vessels as fixed by the President's proclamation of November 13, 1912, are based upon net tonnage. It is, accordingly, important to know the average ratio of the net tonnage to the gross tonnage of vessels, and particularly the ratio of the net tonnage of vessels to the number of tons of cargo carried.

The ratio of the net tonnage of any particular ship to its gross tonnage and to the number of tons of cargo it can carry will vary with the vessel's type of construction and with the rules employed in determining gross and net tonnages. Taking freight steamers of 100 tons gross and larger, the net tonnage as determined by the British rules averages 61.3 per cent. of the gross. The American rules produce a net tonnage averaging about 64½ per cent. of the gross, while the Suez rules make the average net tonnage of vessels using that canal 72 per cent. of the gross. The Panama rules have worked out in practice as was intended, the net tonnage being 70 per cent. of the gross.

The actual lading of vessels will, of course, depend upon the kind of cargo taken, the amount of freight available, and the type of vessel employed. Modern cargo steamers carry, on an average, about 2¼ tons of dead-weight freight for each ton net, when abundant cargo is available. The approximate ratio of net, gross and cargo tonnages for dead-weight freight steamers is 1 to 1½ to 2¼. A cargo steamer of 6,000 tons gross tonnage will measure about 4,000 tons net tonnage and will carry about 9,000 tons of dead-weight freight. When dead-weight freight constitutes only a part of the cargo and the remainder of the lading is made up of measurement freight,

the ratio of cargo tonnage to net tonnage may be as high as 2¾ to 1.

In the actual conduct of the ocean transportation business, ships are obliged to make some of their voyages in ballast or with only a partial lading, and the actual relation of cargo and net tonnages is less than the theoretical ratios just stated. An investigation made by the writer in 1899 indicated that the ratio of cargo tonnage to net tonnage in the shipping engaged in the ocean commerce of the United States, including sailing vessels and steamers, was about 1¾ to 1. During the 13½ months that the canal was open prior to the temporary closing of the waterway in September 1915, the ratio of net tonnage to cargo tonnage—including in the figures for net tonnage the vessels in ballast as well as laden ships—was 1.27 to 1. If vessels in ballast be excluded, the ratio of net tonnage to cargo is 1.40 to 1. The ratio of cargo and net tonnages at the Panama Canal would be lower than the ratio obtaining in the entire commerce of the United States, because the Panama net tonnage equals seven-tenths of the closed-in capacity of vessels, but the ratio at Panama also indicates that the vessels using the waterway did not average as full a lading as do the vessels engaged in the commerce of the world generally. The figures show that the percentage of vessels passing through the

Panama Canal in ballast is considerably larger than the corresponding percentage for the Suez Canal. At Suez the tonnage of vessels in ballast is but 4 per cent., while at Panama it has been 7 per cent.

It is important that the charges made for the use of the Panama Canal shall accord with sound principles, that the tolls collected shall be fair to the owners of ships and also to the United States Government which is the owner and manager of the canal. The general principle adhered to by the President in fixing Panama Canal tolls was that the charges should be levied upon the actual capacity of vessels of commerce—that is, upon space available for passengers and cargo—and that in the case of warships the charges should be in accordance with the weight or displacement of vessels.

Vessels are of many types and vary greatly in design. Merchant ships differ largely as regards the relation of size of ship to earning capacity. Inasmuch as the revenues of shipowners depend upon the earning capacity of vessels, it follows logically that the charges imposed upon merchant vessels should be levied upon the space that may be used for passengers or cargo. Any other basis of levy is quite certain to apply unequally and thus unfairly to ships of varying types. This will be made clear by the discussion of measure-

ment of vessels which is contained in the following chapter.

The size of warships is not expressed in figures of gross or net tonnage but in tons of weight or displacement. While fighting ships are of many types and of great variety of construction, they all agree in having no earning capacity as does a merchant ship. It was logical to base Panama Canal tolls upon displacement tonnage of warships and to apply measurement rules for the determination of net tonnage only to such naval vessels as transports, colliers, supply ships, and hospital ships, which vessels are similar to merchant ships in construction and use.

The Panama toll upon merchant vessels of $1.20 per net ton was established after careful consideration had been given to the general principles that should control the financial and commercial policy to be followed by the United States in managing the canal, and after studying the probable effects of this and other rates of toll upon the volume of traffic that would use the canal, it being important that the tolls should not unduly limit the usefulness of the canal to the industries and commerce of the world. The principles that should control the United States in its financial management of the canal were well expressed by President Taft in his message of December 21, 1911, in which he stated:

I believe that the cost of such a Government work as the Panama Canal ought to be imposed gradually, but certainly, upon the trade which it creates and makes possible. So far as we can, consistent with the development of the world's trade through the canal and the benefit which it was intended to secure to the east and west coastwise trade, we ought to labor to secure from the canal tolls a sufficient amount ultimately to meet the debt which we have assumed and to pay the interest.

The Panama Canal has cost the people of the United States $400,000,000. The interest and principal of this investment can come only from funds secured from taxes or from the revenues derived from canal tolls. It seems wise and prudent that the United States should adhere to conservative financiering and to sound business principles in the management of the Panama Canal. Public expenditures have increased rapidly, and the unavoidable enlargement of military expenses will necessitate much greater revenues than have been required in the past. In addition to this larger sum for the military and naval establishments, funds will be needed in increasing amount for the promotion of public health, for the irrigation and reclamation of public lands, and for the improvement of rivers and harbors. It is inevitable that taxes must increase. Under these conditions it does not seem wise for the United States to maintain at the expense of the general budget such a costly work as the Panama Canal. Those

who derive immediate benefit from the use of the canal may properly return to the Government a portion of the profits secured from using the waterway, provided this policy can be followed without burdening commerce.

While the canal should be commercially self-supporting, it does not necessarily follow that the expenses of fortifying and defending the canal should be borne by the commerce which makes use of the waterway. The expense of maintaining a naval base at the Isthmus may properly be put upon the naval budget, and there is no special reason why the expense of the fortifications at the Isthmus should not be covered by the appropriations for the army. At least such a policy may justly be followed during the early decades of the operation of the canal while the traffic and revenues of the waterway are being built up.

The fixing of tolls for the Panama Canal was a particular and important instance of transportation rate making, and it was necessary to decide to what extent commercial principles, and in what degree political and national aims should control in determining the charges to be imposed. It would hardly have been advisable for the United States Government to have fixed Panama Canal tolls strictly in accordance with the principles ordinarily followed by private transporta-

tion companies in making freight rates. The Government did not construct the Panama Canal for the purpose of securing maximum revenues from tolls. Charges for the use of the waterway may well be somewhat less than ships can afford to pay for the services rendered by the canal. Indeed, the rate or rates of tolls levied at Panama ought to be a compromise between such charges as would result from adhering strictly to traffic and revenue principles and such charges as would result from giving consideration solely to the attainment of political and national aims. While, if practicable, the canal should be commercially self-supporting, it should be the policy of the United States so to manage the waterway as to develop its traffic and thus enable the canal to accomplish the primary purpose for which it was built—the promotion of the commerce and industries of the United States and of the world at large.

It is obvious that the tolls at Panama must be fixed with reference to the saving which carriers can make by using the Panama Canal instead of alternative routes. If the tolls were made so high as to divert from the canal a considerable share of the traffic that might be secured at lower tolls, it is probable that the revenues of the canal would be reduced; while the waterway would be prevented from giving to the industries and com-

merce of the world the assistance it was intended to render.

The commerce between the two seaboards of the United States and between the west coast of the United States and Europe could hardly be diverted from the canal even by high tolls, but this is not true of the trade between Europe and Chile nor of the commerce between the eastern seaboard of the United States and transpacific countries. A considerable share of the possible traffic of the Panama Canal would probably be diverted by tolls not higher than $2.50 per ton net tonnage. Tolls of that amount, which would average about $2 per cargo ton, would turn a good deal of traffic from the canal to alternative routes.

In fixing the Panama tolls it was necessary to make the charges low enough to enable the canal: (a) to divert from the Straits of Magellan all of the traffic of the Pacific coast of South America with the eastern seaboard of the United States and at least the major share of the traffic between the Pacific coast of South America and Europe; (b) to prevent the use of the Cape of Good Hope route by the commerce between the Atlantic-Gulf coast of the United States and New Zealand and Australia; (c) to divert from the Suez Canal the trade between the eastern seaboard of the United States and the Orient, east of Singapore; and (d) to compete with the Suez

Canal for a part of Europe's commerce with the Far East.

In discussing the relation of tolls to the volume of traffic and the revenues of the Panama Canal, the traffic between the two seaboards of the United States and between the west coast of North America and Europe can be left out of consideration, because the saving in distance and time for the traffic between those sections is in excess of tolls that could wisely be imposed upon vessels operated through the canal over routes connecting other sections of the world. A reference to the relation of the tolls, as fixed, to average freight rates will also make it evident that the tolls will not affect the use of the canal by the traffic between the Pacific seaboard of the United States and countries of the north Atlantic.

Freight rates prevailing during the European War are abnormally high. Under ordinary conditions, the rates via the canal on package freight between the two seaboards of the United States will be from 60 cents to $1 per 100 pounds, that is, from $12 to $20 per ton of 2,000 pounds. Low-grade bulk freight may move at rates as low as 30 to 40 cents per 100 pounds, $6 to $8 per ton, and possibly vessels may be chartered to carry cargo at a cost not exceeding $5 per ton of 2,000 pounds. Rates as low as $5 per ton, however, must be regarded as exceptional. As vessels are now being

loaded in the trade between the two seaboards of the United States, the tolls fixed by the President amount to 80 to 90 cents per cargo ton, or from 4 to 7 per cent. of the freight paid on measurement cargo and about 15 per cent. of the freight on commodities moved in full vessel cargoes at low charter rates. The relation of the tolls to the freight rates between Europe and the west coast of North America is not very different from the relation of the tolls to the freight rates on traffic between the two seaboards of the United States.

In fixing tolls it was necessary to give special consideration to the charges that vessels might profitably pay for using the canal on voyages between the west coast of South America and Europe and the eastern seaboard of the United States. Vessels trading between the Atlantic seaboard of the United States and ports on the west coast of South America as far south as the nitrate ports of northern Chile would unquestionably use the Panama Canal, even though the tolls charged were higher than those that have been established: but ordinary freight vessels making the run from New York or some other Atlantic port via the Panama Canal to Valparaiso would effect a saving, due to reduction in time and distance, of only $1.20 to $1.40 per ton net tonnage. If saving in time and distance were the only

factor determining the choice of routes, tolls higher than $1.20 per ton might divert to the Straits of Magellan a part of the traffic between the eastern seaboard of the United States and central Chile; but, as was explained in Chapters III and XI, there are factors other than time and distance which influence the routes taken by vessels. The cost of fuel en route and the opportunities to trade at intermediate ports are quite as influential as tolls in determining the course chosen by vessels.

Although ordinary freight vessels on a voyage between Europe and Valparaiso can effect a distance saving via Panama of only 60 to 70 cents per ton net tonnage, the fuel expenses, and the space which the ship will necessarily have to devote to coal bunkers if the Panama route is taken, will be enough less than the expenses and fuel space via the Straits of Magellan to cause the Panama route to be preferred, although the tolls are quite double the saving that results from the shortening of time and distance. It will be remembered that coal is very expensive at Montevideo and at Buenos Aires, and that vessels running between Europe and Chile must either take on coal at one of these ports or devote to bunkers space that might otherwise be used for cargo. Moreover, the Panama route is preferable to a course through the Straits of Magellan

not only because of cheap fuel but also because most vessels from Europe to Chile will desire to discharge, and possibly take on, cargo at South American ports between Panama and Valparaiso.

Vessels making voyages between the eastern part of the United States and New Zealand now have the choice of the Panama and the Magellan routes, and the saving resulting from the shortening of time and distance via Panama amounts to $1 to $1.10 per ton net tonnage for ordinary freight vessels; but fuel expenses via Panama will be so much less than those via the Straits of Magellan as to make it profitable for ships to pay Panama tolls considerably in excess of $1 per ton net tonnage. For voyages from the eastern seaboard of the United States to Australia the choice for freight vessels is between the Panama and Cape of Good Hope routes; and the saving via the Panama Canal, due to shorter time and distance, is, for most Australian ports, in excess of the tolls now being levied at Panama.

Before the opening of the Panama Canal, the trade between the eastern seaboard of the United States, the Philippines, and the Orient was carried on via the Suez Canal. At the present time most of the traffic is handled via Panama. It has been pointed out that Manila and Hongkong are about equally distant from New York

via the Suez and Panama routes. The territory north and east of those two Oriental cities is within the Panama Canal traffic zone, while that south and west is geographically tributary to the Suez route. The tolls for the two alternative routes are now equal, and the course taken by vessels will be determined by relative fuel expenses and by the consideration that must be given to engaging in trade at intermediate ports. In all probability some traffic from places north and east of Hongkong and Manila will be carried to the Atlantic-Gulf seaboard of the United States via the Suez Canal, and it is equally probable that some vessels will start from points west of Hongkong and Manila and proceed via Panama to the eastern ports of the United States. There will be some overlapping of routes in the region between Singapore and Yokohama. On the whole, the fuel expenses are somewhat less via Panama than via Suez, and as long as tolls at Panama and Suez are equal, most of the traffic between the Atlantic seaboard of the United States and the Pacific seaboard of Asia may be expected to move via Panama.

It is not expected that much of Europe's commerce with the Far East, even with Japan, will be diverted from the Suez Canal to the Panama route. The commerce of Europe with the entire Pacific seaboard of Asia is geographically within

the Suez Canal traffic zone. In spite of this fact, however, some vessels leaving Japan for Europe will probably cross the north Pacific in order to discharge and take on cargo at American ports, and in order to secure the advantages of cheap coal to be had in the stations at and east of the Panama Canal.

From this brief survey of the relation of tolls to the traffic that may make use of the Panama Canal, it is evident that tolls at Panama equal to those at Suez would not unduly restrict the traffic through the American waterway; whereas the charges on merchant vessels at Panama appreciably higher than $1.20 per ton net tonnage—the equivalent of the tolls at Suez—might considerably reduce the traffic and possibly the revenues of the Panama Canal. The other consideration to be given weight in fixing Panama tolls would, naturally, be the relation of prospective revenue to the current expenses and fixed charges of the canal.

The revenues from the canal ought in the long run to cover all the expenses for operation and maintenance, the annuity that is payable to the Republic of Panama, and the interest on the investment which the United States has made in constructing the canal. These expenses will amount to at least $17,250,000 annually, the items being:

Expenses for operation, maintenance, zone sanitation and government.....	$5,000,000
Annuity payable to the Republic of Panama	250,000
Interest at 3 per cent. on $400,000,000....	12,000,000
Total.....	$17,250,000

The item of $5,000,000 for current annual expenses is estimated, and will be less than the actual expenses until the canal is fully completed, and the slides have been overcome, and the canal is being operated under normal conditions. The items in the foregoing statement, moreover, do not provide for returning to the United States Treasury the sum that the canal has cost. Should the canal revenues prove sufficient, it would be a good business policy for the United States, beginning with the second decade of the operation of the canal, to set aside annually three-fourths of one per cent. of the investment, or $3,000,000, as an amortization fund. If this can be done, and is done, the canal will carry itself currently and will, in time, return to the people of the United States for investment in other needed public works the amount expended at Panama.

A careful preliminary study of the traffic that would use the Panama Canal indicated that the net tonnage of shipping passing through the waterway would amount to about 10,500,000 tons

annually during the early years of operation, that the increase in tonnage during the first decade would not be less than 60 per cent., and that there would be an annual traffic of 17,000,000 tons net tonnage by 1925. The European War, which began just before the opening of the canal, greatly reduced the volume of ocean commerce and the tonnage of ships employed. The tonnage of canal traffic during the first year was probably not more than half what it would have been had peace prevailed throughout the world. Then, as a second interference with the development of traffic during the early years of the canal, came the slides that closed the waterway to all shipping from September 18, 1915, to April 15, 1916, a period of seven months. The closing of the canal for more than half a year has not only cut down the tonnage of the second year, but, by diverting shipping to services in commerce not carried on through the canal, will tend to retard the growth of canal traffic during the third year.

An annual traffic of 10,500,000 tons net tonnage, the amount predicted for the early years of the canal's operation, would yield a yearly revenue of about $12,000,000, with tolls at $1.20 per ton net tonnage upon loaded merchant vessels and with a reduction of 40 per cent. from that rate on vessels in ballast. A traffic of 17,000,000 tons annually, the volume of business predicted for

1925, would yield revenues of about $20,000,000 at the rate of tolls that have been established. It is thus evident that had the traffic of the canal been equal to the tonnage predicted, the revenues would have been less than the current expenses and fixed charges of the canal during the first few years; while the revenues at the end of a decade would, if the predicted volume of traffic is reached, be fully equal to the operating and maintenance expenses and fixed charges.

As the result of the European War, the actual traffic during the first 13 months of the operation of the canal amounted to 5,260,826 tons net tonnage, the cargo tonnage being 6,706,915. During the three months preceding the temporary closing of the canal in September 1915, the net tonnage exceeded 500,000 tons per month, the tonnage of cargo averaging over 600,000 tons per month. The tolls collected during the 13 months ending September 17, 1915, amounted to $5,754,673. During the six months, from March 1915 to August 1915, inclusive, the tolls averaged about $521,000 per month. After the canal had been operated 13 months there followed seven months of entire cessation of traffic due to the closing of the canal, and the traffic and revenues of the second year's operation of the canal will be relatively small.

The Panama Canal tolls were fixed by the

President in November 1912, and of course without knowledge of the effect which the European War and the Culebra slides would have upon the predicted traffic and revenues of the waterway. The considerations that led to the adoption of a toll on loaded merchant vessels of $1.20 per ton net tonnage, with 40 per cent. reduction in the case of vessels without cargo or passengers, may be summarized as follows:

A study was made of the probable effects of tolls upon the volume of available traffic and upon the revenues obtainable, and it was found that a high toll would largely restrict traffic, while an especially low toll would not yield sufficient revenue.

An estimate was made of the revenue that would be required to meet operating and other current expenses and to pay fixed charges, and a schedule of tolls was adopted with reference to securing ultimately, although not immediately, revenues equal to the estimated expenses.

The tolls charged for the use of the Suez Canal were and still are 6.25 francs ($1.20) per ton net tonnage on loaded vessels and 3.75 francs (72 cents) per ton on vessels in ballast. Inasmuch as it was desirable to put the Panama and Suez routes upon an equal competitive basis, it was thought inadvisable to have higher tolls on merchant vessels at Panama than at Suez.

Investigation showed that a toll of $1.20 per ton net tonnage upon loaded merchant vessels would not divert much traffic from the Panama route. A summary of that investigation has been presented in this chapter.

A toll of $1.20 per ton net tonnage upon loaded merchant vessels, with a reduction of 40 per cent. for vessels without passengers or cargo, promised to yield at the end of ten years an annual revenue equal to the operating and maintenance expenses and interest charges, provided all vessels, coastwise and foreign, were required to pay tolls.

The policy finally adopted by the United States Government was to collect tolls of all vessels, including those operated in the coastwise trade of the United States. To have exempted the owners of coastwise vessels from the payment of tolls for the use of the Panama Canal would have been a mistake. Free tolls for any class of shipping would have been in violation of the general principle that those who use the canal may justly be required to make some compensation for the benefit received. Free tolls to coastwise vessels, moreover, would have meant government assistance to a class of shipping that does not need further aid. The coastwise commerce of the United States being limited to American vessels, the owners of coastwise shipping do not have to meet for-

eign competition. Whatever aid the Federal Government gives to ships under the American flag should be given to vessels engaged in the foreign trade in competition with vessels under the flags of other nations.

The exemption of coastwise shipping from the payment of tolls would have been of benefit mainly to the coastwise carriers. Toll exemption would have been a form of subsidy to the owners of vessels. Shippers and consumers would have received little benefit. Neither the rates of the steamship lines nor the charges of rail carriers that compete with the steamship lines will be appreciably higher because tolls are charged upon coastwise shipping. While there is competition among the lines operating coastwise through the canal, and while there will be competition between the transcontinental railroads and the coastwise carriers, the competition of the vessel lines with each other will be regulated by "conferences."

The charges made by the coastwise carriers, whether there are tolls at Panama or not, will be fixed primarily with reference to what the shippers can and will pay for the services desired. In the long run, the value of the service to the shippers, rather than the cost of the service to the carriers, will determine the level of coastwise rates, and the tolls paid for the use of the Panama Canal will be an operating cost borne by the car-

rier. Inasmuch as the coastwise carriers do not need government assistance, the exemption of those carriers from the payment of Panama tolls would not be a justifiable policy.

CHAPTER XIII

THE PANAMA TONNAGE RULES

The President's proclamation of November 13, 1912, fixing the charges for the use of the Panama Canal, directed the Secretary of War to prepare rules for the measurement of vessels to determine the tonnage upon which the tolls should be paid. After a thorough study had been made of the tonnage rules of Great Britain, Germany, the United States, and the Suez Canal Company, and after considering carefully the many technical questions connected with the ascertainment of the exact tonnage of vessels, a special set of Panama tonnage rules was formulated. The rules, as framed, were put in force by proclamation of the President issued November 21, 1913.

The schedule of Panama tolls makes the charges on "merchant vessels carrying passengers or cargo $1.20 per net vessel ton—each 100 cubic feet—of actual earning capacity," with a reduction of 40 per cent. in the case of vessels in ballast. The toll of $1.20 per ton net tonnage is also payable by army and navy transports, colliers, hospital ships and supply ships. Upon other

classes of naval vessels the tolls are 50 cents per displacement ton.

This schedule of charges was decided upon after considering the effect of tolls upon the volume of traffic, and after taking into account the revenues needed to meet the current expenses and fixed charges of the canal. Inasmuch as the amounts paid by those who use the canal and the revenues received by the Government necessarily depend upon the tonnage upon which the tolls are paid, it was especially important that the charges should be imposed upon a tonnage that would be fair both to the owners of ships and to the United States Government, which is the owner and manager of the canal. It was necessary that the rules employed in determining the tonnage upon which canal tolls were levied should be specific, exact, and capable of being easily administered. It was also desirable that the tonnage rules should be so formulated as to apply equitably to the different types of ships in use today and to the types that may be developed with the progress of commerce and the art of shipbuilding, it being recognized that the tonnage rules when once adopted should be permanent, provided they are so framed as to apply with equal fairness to vessels of changing type and design.

The general principle laid down in the President's proclamation of 1912 was that the Panama

tolls upon vessels of commerce should be levied upon their actual earning capacity, i. e., upon the space available for passengers and cargo. This principle made it necessary to base tolls upon the net tonnage of vessels and to formulate, for the measurement of vessels and for the calculation of tonnage, rules that would produce a net tonnage which corresponded closely with the space actually available for the accommodation of passengers and the stowage of cargo.

Before the schedule of tolls was recommended to the President, consideration had been given to the various kinds of tonnage upon which tolls might be imposed, and the decision had been reached that the charges for the use of the canal should be upon the net tonnage of vessels. Indeed, it was impossible to recommend a schedule of tolls without deciding upon the basis upon which the charges should be made. The tonnage rules which were drafted subsequently to the establishment of the schedule of tolls were framed with a view to giving effect to the principle that tolls should be levied upon the earning capacity of merchant vessels and upon the displacement tonnage of warships, and special effort was made so to frame the rules that they would apply with accuracy to different classes and types of vessels.

In addition to carrying out the principle that

tolls upon merchant vessels should be based upon the earning capacity of ships and the principle that the tonnage rules should apply as equitably as possible to the many and changing types of vessels, it was necessary so to frame the rules that they would fulfill other requirements and conditions. It was imperative that the joint effect of the schedule of tolls and the tonnage rules should be adequate revenues secured without unduly restricting the use and usefulness of the canal. It was important, also, that the measurement rules should be easily administered, that they should be so exact and specific as to be interpreted and applied in the same way by admeasurers of vessels in different countries, in order that as few vessels as possible would require measurement after reaching the canal.

In fixing the basis for Panama tolls and in framing the tonnage rules it was recognized that the basis adopted and the rules formulated ought not to place any restrictions upon the size of spaces set aside for the accommodation of the crew, nor limit the provisions that vessel owners may make to increase the safety or comfort of crews and passengers. The tonnage upon which tolls are charged not only ought not to include spaces set aside for the use of the crew, but the rules should encourage shipowners to be liberal in the allotment of crew spaces.

In the absence of controlling reasons to the contrary, it was desirable that tolls at the Panama Canal should be based upon the tonnage upon which vessels are required to pay charges at other canals and at the various ports of the world. Theoretically, vessel charges ought to be levied upon the same tonnage in all ports and at all canals of the world, but this is not the present practice and probably will not be the practice for some time to come. Net tonnage, however, is the basis of charges and taxes on shipping throughout the world, and this fact was a strong reason for basing Panama tolls upon net tonnage, accurately and scientifically determined.

It was further realized and also considered important that the Panama measurement rules should not hinder the construction or use of the best type of ships; that the rules should not dissuade designers and builders of vessels from adopting the latest improvements, or from substituting better and more economical engines, or from introducing any other changes that would make vessels safer, more comfortable, and more efficient.

To have based Panama Canal tolls upon the gross tonnage or the displacement tonnage of vessels or upon the cargo carried would have violated the principle that vessels should pay tolls upon their earning capacity, and would have meant the

failure to observe the conditions and requirements enumerated in the preceding paragraphs.

It has been argued that inasmuch as the charge for the use of the canal should be based upon the vessel—the passage of vessels through the canal being the service rendered for the charge made—the tolls should be levied upon either the gross tonnage or upon displacement of ships, the gross tonnage being the measure of the size of the vessel and the displacement tonnage the expression of its weight. There are, however, controlling reasons why Panama tolls should not be based upon the size or weight of vessels. It is necessary that the tolls should be levied without discrimination against improved types of ships and that the charges should treat vessels of different types equitably. Neither gross tonnage nor displacement tonnage takes account of differences in the construction of vessels or in the uses to which they are put in actual services. Vessels of the same closed-in capacity, or gross tonnage, will differ largely as regards earning capacity, and the same is true of vessels of like weight. Moreover, tolls based upon gross tonnage would impose charges upon spaces set aside for accommodation of the crew and for navigation purposes. Such spaces ought to be exempted from tolls. To have based charges upon the entire closed-in capacity of a ship might have induced builders and owners of

vessels to restrict crew spaces to the minimum permitted by law.

Panama tolls upon gross tonnage would be so favorable to slow steamers with low engine power, as compared with faster ships, as possibly to dissuade steamship companies from introducing into the services through the canal the best types of ships at as early a date as they would introduce such vessels were the measurement rules so framed as to treat vessels of high engine power and speed as fairly as slower vessels are treated. It is, of course, desirable that the Panama Canal should always be used by the most modern types of vessels.

Another reason against basing tolls upon gross tonnage or displacement is that all charges upon vessels, except for pilotage (which charges are usually based upon the draft of vessels), are levied upon net tonnage. In so far as it is possible, without violating the general principle of basing tolls upon the earning capacity of vessels, it should be the policy of the United States to conform to the general practice of the world as regards charges upon shipping.

It would seem *a priori* that the Panama tolls should be based upon what vessels carry—upon the tons of cargo and the number of passengers in the vessel—for the reason that charges upon cargo are imposed upon the carrier's ability to

pay. Charges upon the vessel's cargo and passengers are levied upon the carrier's source of income from the vessels that use the canal. Moreover, tolls based upon cargo may, at least in theory, be graded according to the value of different kinds of commodities, the charges being high on valuable articles and low on low-grade bulky freight. In other words, tolls upon cargo might be in accordance with what traffic of different kinds can bear.

Tolls based upon cargo would not be fixed with reference to the cost to the United States of performing the service of passing vessels through the canal. In fixing the basis and rate of tolls it was obviously necessary to decide to what extent the charges should be made with reference to the cost of the service and to what extent they should be made with reference to what the traffic would bear. The decision reached was that the charge should be on the vessel and should take into account the cost of the service, at least to the extent of making tolls high enough to produce revenues equal to the current expenses and fixed charges. At the same time it was recognized that it was necessary so to adjust the canal charges that they would not prevent the use of the waterway by traffic geographically tributary to the Panama route. Negatively stated, the tolls should not be what the traffic would not bear.

A closer consideration of the practical working of tolls based upon cargo shows that such tolls would be undesirable for the carriers and shippers as well as for the United States. Tolls upon cargo would necessarily vary with articles or classes of commodities. It would be necessary carefully to classify ocean freight and to work out a schedule of class rates or tolls relatively reasonable as between different kinds of commodities. Tolls payable by any particular vessel would be determined by calculating from the ship's detailed manifest of cargo the tonnage of each of the several classes of goods contained in its lading.

It is believed that tolls upon cargo would be administratively impracticable. The classification of ocean freight would be difficult and would require frequent revision. The calculation of the tonnage of cargo composing the lading of a freight vessel whose manifest might contain several hundred entries would necessarily be made either before the ship cleared from its port of departure or while the vessel was en route from the port of clearance to the Panama Canal. The ship's manifest is the last paper taken aboard the vessel. In order not to delay a vessel's clearance it is customary for a steamship company's office force to work overtime for one or more days in order to have the ship's manifest ready as soon as possible

after the vessel's cargo has been loaded. To make a calculation of the tonnage of the different classes of freight as a basis for canal charges might so delay vessels as to burden ocean commerce.

From the Government's point of view, cargo would be an undesirable basis for Panama tolls because of the practical impossibility of detecting and preventing fraud. A vessel presenting itself at the canal, loaded with possibly a hundred or more different kinds of articles, could not be so inspected by the collectors of tolls as to check up the statement of cargo with the commodities contained in the ship's hold. It would be necessary for the canal officials to accept the sworn statement of the owners or masters of the ship, and this would open the door to fraud. To prevent fraud in the collecting of tolls at a transit canal, it is necessary to base charges upon the ship rather than upon the cargo.

The decision having been made that the Panama tolls should be based upon net tonnage so determined that the tonnage would be an exact expression of the space available for passengers and cargo, it was necessary to frame measurement rules for determining both gross and net tonnage. In other words, the rules must provide for the determination of the entire closed-in capacity or gross tonnage of vessels, and must stipulate with the greatest possible preciseness the spaces to be

deducted from the entire closed-in capacity to determine the space available for the stowage of cargo or for the accommodation of passengers. It was especially necessary that the rules should be so clear and specific in all their requirements as to make evasion of the rules impossible.

The first problem to be solved in framing rules to determine gross tonnage was to define what spaces are "closed-in" and what are "open." It would seem that these terms define themselves, but in actual practice the definition of a closed-in space presents no little difficulty. The definition of a closed-in space contained in the rules is worded as follows:

> By permanently covered and closed-in spaces on or above the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and which, therefore, represent an increase of capacity that is or may be used for the stowage of cargo or for the berthing and accommodation of the passengers, the officers, or the crew.

The rules further provide that "spaces considered as 'permanently closed-in' and spaces permitted to be exempted from measurement shall be determined solely by the provisions contained in these rules," and this statement is followed by an enumeration of all the spaces that may be exempted from measurement and thus excluded from the gross tonnage. All spaces except those enum-

erated must be measured and included in the gross tonnage.

After gross tonnage has been accurately determined, the ascertainment of the true net tonnage or actual earning capacity requires the deduction from gross tonnage of the spaces occupied for power, for crew accommodations, and for the navigation of the vessel. The largest deduction from gross tonnage is for engine and fuel spaces, and in framing the Panama rules it was necessary to decide between two well known rules as to propelling power deductions: the percentage, or British Board of Trade rule, and the Danube rule. These rules require careful definition and a brief explanation.

The percentage or British Board of Trade rule provides that the deduction for propelling power shall be 32 per cent. of the gross tonnage in the case of vessels with screw propellers, when the space occupied by engine and boiler rooms is more than 13 and less than 20 per cent. of the gross tonnage of the vessel; and shall be 37 per cent. of the gross tonnage in the case of vessels with paddle wheels when the space occupied by the engine and boiler rooms is more than 20 and less than 30 per cent. of the gross tonnage. In the case of screw-propelled vessels whose actual engine-room space does not come between 13 and 20 per cent. of the space included within gross ton-

nage, and as regards vessels propelled with paddle wheels whose engine-room space does not come between 20 and 30 per cent. of the space included in gross tonnage, the deduction for propelling power shall be determined by applying the percentage rule or the Danube rule as may be determined by the Board of Trade and the owners of vessels. The practice is to apply the Danube rule.

The Danube rule stipulates that the deduction for propelling power shall be the actual volume or space occupied by the engine and boiler rooms, with the addition of 75 per cent. in the case of screw-propelled vessels, and with the addition of 50 per cent. in the case of vessels propelled by paddle wheels.

In applying either the percentage or the Danube rule, the engine and boiler rooms include spaces actually occupied by the engines and boilers, and by the shaft tunnel or tunnels, when the vessel is screw-propelled, and the spaces framed in around the funnels and within the light and air casings above the engine and boiler rooms.

Some tonnage rules give the owner of vessels with fixed bunkers the option of having power deductions made by actual measurement of the spaces occupied by the fuel and the engine and boiler rooms, as just defined. This option can be given only when the fuel occupies fixed bunkers.

In most cases, however, the amount of deduction permitted by applying the British Board of Trade or percentage rule is in excess of the space actually occupied by power and fuel, while the application of the Danube rule results in a deduction slightly in excess of that secured by actual measurement.

Because of the fact just stated, the percentage rule is objectionable and was not incorporated in the Panama tonnage rules. This rule originated in the British Merchant Shipping Act of 1854 and was adopted for the purpose of aiding the steamship, which, then being in the early stages of its development, had difficulty in competing with sailing vessels. The deduction allowed by the rule was not only liberal at the beginning, but has tended to become more liberal with the improvement of the marine engine. This is due to the fact that the rule is wrong in principle, there being no permanent general ratio between the size of the engine room and the gross tonnage of vessels. If the percentage rule for propelling power deduction had been accurate in 1854 it would not have long remained accurate. Marine engines have become increasingly efficient and thus able to develop greater power per unit of size. During recent years, moreover, internal combustion engines have come into use and they occupy less space than do steam engines. As all

marine engines are improved, they consume less coal or oil per unit of power generated or work done, and the coal space required per unit of power tends to decline; while the use of oil instead of coal in many vessels tends further to reduce the space occupied by fuel.

Most freight vessels are now so designed and constructed that the engine room occupies slightly more than 13 per cent. of the spaces included within gross tonnage, in order that the vessel, when measured by British, American, German and most other tonnage rules, will be entitled to a reduction of 32 per cent. for power and fuel. Vessels whose engine room occupies 18 per cent. or less of the space included within gross tonnage are unduly favored by the 32 per cent. rule. For example: A vessel measuring 6,000 tons gross and having an engine room occupying 14 per cent. of the space included within gross tonnage will secure a deduction for propelling power of 1,920 tons. Under the Danube rule the deduction would be 1¾ times 14 per cent. or 24½ per cent., which amounts to 1,470 tons. Such a vessel would thus have, because of the rule employed in making propelling power deduction, a net tonnage of 450 tons less than its earning capacity. Tolls of $1.20 per ton on 450 tons would amount to $540, the sum which the vessel would save in canal charges each time it made use of the waterway. The only

proper rule for propelling power deduction is one that provides either for the deduction of the actual space occupied by machinery and fuel, or provides for the deduction of as close an approximation to the actual space as can be obtained by applying one general formula, such as the Danube rule, to all vessels.

The Danube rule for propelling power deduction was adopted in 1871 by the European Commission of the Danube. This rule, however, really dates from the passage of the Merchant Shipping Act of 1854, by which the rule was applied to propelling power deductions in the case of screw steamers whose engine-room space did not come within 13 to 20 per cent. of the space included in gross tonnage, and to paddle wheel steamers whose engine-room space did not come within 20 to 30 per cent. of the spaces included in gross tonnage.

The percentage rule for deducting propelling power spaces was considered by the British Board of Trade to be so unfair to the Government that the board made three unsuccessful attempts, in 1866, 1874 and 1881, to have Parliament adopt the Danube rule in place of the percentage rule that had been established by the act of 1854.

The International Tonnage Commission which met in Constantinople in 1873 framed the Suez rules for the measurement of vessels. The Dan-

ube rule concerning power space deduction was adopted for vessels having movable bunkers, while for vessels with fixed bunkers the owners were given the option of having the deduction made by the Danube rule or by actual measurement of engine room and fuel spaces. The Suez rule for power deduction was incorporated in the Panama tonnage rules.

The deductions from gross tonnage usually allowed for the spaces occupied by the crew are the portions of the ship actually set aside for the accommodation of the ship's personnel. The Suez rules limit the deductions, other than for propelling power, to 5 per cent. of the gross tonnage. This may have the effect of limiting the accommodations provided for crews and is, for that reason, an unwise restriction. The Panama tonnage rules provide that "all spaces or compartments occupied by or appropriated for the use of the officers and crew of the vessels shall be deducted." The Panama rules also provide, as is customary, for the deduction from the gross tonnage of the spaces and compartments occupied by the ship's doctor, by the master of the vessel, and by the kitchens and laundries. Provision is also made for the deduction of the spaces occupied by machinery used in operating the vessel and of the spaces set aside for boatswain's stores. These and other allowable deductions

are specifically enumerated in the rules. No spaces other than those enumerated may be deducted from gross tonnage to determine net tonnage.

An important question connected with the determination of the gross and net tonnage of vessels concerns the treatment to be accorded so-called "shelter deck spaces." Taking advantage of the phraseology used in the decision of the House of Lords, in 1875, in the case of the steamship *Bear,* British shipowners have had so-called "tonnage openings" made at one or two places in the uppermost full length deck of freight vessels. On account of these openings vessel owners secure exemption, under British rules, and consequently under the rules of other countries, from measurement of the space between the uppermost, or so-called "shelter deck," and the deck next below. This is permitted in spite of the fact that the deck openings can be covered over when the ship is at sea and made practically watertight, the space under the shelter deck being used to carry cargo and stores.

The Suez rules do not exempt the shelter deck spaces from measurement, and it is provided in the Panama rules that "in the case of a continuous deck with one or more deck openings (usually designated as tonnage openings) that may be so closed as to permit cargo or stores to be carried

in the space under the deck, or under portions thereof . . . the spaces under such a deck shall be measured and included in gross tonnage," excepting such spaces as are between "opposite openings at least 3 feet in height in the side walls of the ship not provided with means of closing." In other words, the Panama rules treat spaces under the shelter deck as closed-in spaces, which they are in fact and in practice.

One other feature of the Panama tonnage rules should be mentioned. Only closed-in spaces are included in gross and consequently in net tonnage; but it is the practice of many vessels to carry cargo upon the open deck. The Suez Canal Company does not impose tolls upon the space occupied by deck cargo; on the contrary, the British tonnage rules provide that space occupied by deck cargo shall be measured and added to the space or tonnage upon which port charges are levied. The Panama rules provide that the space occupied by stores, timber, cattle, or any other cargo carried upon an open deck, or in spaces exempted from measurement, shall be added to the tonnage upon which tolls are paid. The space occupied by deck cargo shall be measured at the time of the vessel's application for passage through the canal. The owners of vessels that carry large quantities of lumber on deck have, naturally, opposed this rule requiring the payment of tolls on

deck cargo space. To exempt deck cargo spaces from toll charges would, however, discriminate unjustly in favor of vessels constructed to carry a large tonnage above deck, and against vessels whose cargo spaces and earning capacity are all below deck.

The Panama rules are similar to those of the Suez Canal Company. Both sets of rules are based upon the same general principle, and their differences concern relatively minor details. The Suez rules, like those adopted for the Panama Canal, are framed with a view to including in gross tonnage all closed-in spaces and to making net tonnage an accurate expression of the actual earning capacity. The Suez tolls are levied upon the *tonneau de capacité* of vessels. Shelter deck spaces are included in gross and net tonnage. Power deductions are made in accordance with the Danube rule, with the added provision that, in the case of vessels with fixed bunkers, the actual space occupied by the engine room and bunkers may be deducted if the owner prefers. Deductions for spaces occupied by the crew or used for navigating the vessel are limited to 5 per cent. of the gross tonnage. Space occupied by deck cargo is not included in the tonnage upon which tolls are levied. As stated above, this is a provision of the Suez rules that could not wisely be incorporated in the Panama code.

One of the important differences between the Suez and Panama rules concerns the definition of closed-in and open spaces. The Suez rules define both closed-in and open spaces. This gives shipowners an opportunity to quibble with the admeasurers of vessels as to the application of the definitions to particular spaces. The Panama rules seek to avoid this by defining only closed-in spaces and by enumerating all the spaces that may be exempted from measurement, the rules stipulating that all other closed-in spaces than those enumerated must be included in the measurement and in the gross tonnage. The Suez rules, furthermore, exempt all double-bottom spaces from measurement, while the Panama rules require double-bottom spaces used to carry feed water or to store fuel oil to be included in the gross tonnage. The Panama rules exempt double-bottom spaces only when they can be used, or are used, solely for water ballast.

The Suez and Panama rules, furthermore, differ to some extent as regards the measurement of closed-in spaces within superstructures and under decks with tonnage openings. The Suez rules are believed to be unnecessarily complicated and to be inconsistent in certain particulars. Without going into details, it is sufficient to say that the Panama rules regarding the measurement of spaces within superstructures and under decks

with tonnage openings apply alike to all vessels, and are believed to be simpler and more logical than the Suez rules in this particular.

The principal difference between the Panama and Suez rules as regards deductions from gross tonnage to determine net tonnage is the limitation, above referred to, in the Suez rules restricting deductions for crew and navigation spaces to 5 per cent. of the vessel's gross tonnage. In numerous minor particulars the Suez and Panama rules differ as regards deductions from gross tonnage, the Panama rules being somewhat more liberal than those of the Suez Canal Company.

As was stated above, the Suez rules do not include spaces occupied by deck loads in the tonnage upon which tolls are levied. This provision of the Suez rules is, however, relatively unimportant, because the traffic through the Suez Canal does not contain much tonnage that can advantageously be carried on an open deck.

In general, the Panama rules give a vessel a somewhat larger gross tonnage and usually, though not always, a somewhat smaller net tonnage than the vessel would be given if measured by the Suez rules. The ratio of net to gross tonnage under the Panama rules averages 70 per cent., while under the Suez rules the ratio is 72 per cent.; but, inasmuch as the gross tonnage is somewhat more under the Panama rules than

under the Suez rules, the net tonnages resulting from applying the two sets of rules are not very different.

One of the important differences between the Suez and Panama rules is that the Suez rules are applied to warships as well as to vessels of commerce. Warships using the Suez Canal pay tolls upon a net tonnage, whereas, in the case of the Panama Canal, warships pay tolls upon their weight or displacement tonnage. The Panama rules in this regard are unquestionably superior to those in force at Suez. A warship has no net tonnage in the sense that a merchant vessel has, and the application of measurement rules to a warship is a complicated and arbitrary process. Displacement tonnage is the logical basis for tolls upon fighting ships.

Had the measurement rules contained in the navigation laws of the United States been scientific—that is, had they provided for the inclusion in gross tonnage of all closed-in spaces and had they provided for such deductions as would result in a net tonnage practically the equivalent of the actual earning capacity of vessels—it would have been advisable to have adopted for the Panama Canal the measurement rules contained in the United States statutes. This, however, was not desirable, because, first of all, the American rules omit important spaces from measurement.

An old law originally adopted with reference to river steamboats exempts from measurement that portion of the ship which is "used for cabins and staterooms constructed entirely upon the first deck, which is not a deck to the hull." Under this law ocean passenger steamers having several tiers of cabins are unduly favored as compared with freight steamers and with passenger vessels having only one tier of cabins. Furthermore, the American rules, as now interpreted by the United States Commissioner of Navigation, exempt from measurement the spaces under decks provided with tonnage openings, the American rules now being similar to those of Great Britain in this regard. Again, the American rules exempt deck load spaces from measurement and from tonnage charges.

The American rules are faulty in that they provide for power and fuel deductions by the percentage, or British Board of Trade, rule. As has been explained, this rule allows excessive deductions and makes the net tonnage of most freight vessels less than their actual earning capacity. The Panama rules as regards propelling power deductions are distinctly superior to the rules contained in the navigation laws of the United States.

On account of the unfortunate wording of a portion of the act of August 24, 1912, providing for

the operation of the Panama Canal, the rate of tolls that may be levied upon some vessels differs somewhat from the rate contained in the schedule of tolls fixed by the President's proclamation of November 13, 1912.

Section 5 of the Panama Canal Act of 1912 authorizes the President to prescribe the tolls that shall be levied for the use of the Panama Canal and also provides that "tolls may be based upon gross or net registered tonnage, displacement tonnage, or otherwise, and may be based on one form of tonnage for warships and another for ships of commerce"; but unfortunately the law also contains the provision that "if the tolls shall not be based upon net registered tonnage, they shall not exceed the equivalent of $1.25 per net registered ton as nearly as the same may be determined, nor be less than the equivalent of 75 cents per net registered ton."

The owners of certain vessels whose tolls, at $1.25 per net registered ton upon the tonnage resulting from applying the rules contained in the navigation laws of the United States, would amount to less than $1.20 per ton net tonnage, as determined by the Panama rules, claimed that they were entitled under the statute of 1912 to tolls not exceeding $1.25 per net *registered* ton, American measurement. The question was referred to the Attorney General of the United States, who

decided that the Panama Canal Act of 1912 fixed the maximum limit for Panama tolls at $1.25 per ton upon the net registered tonnage of vessels as determined by the statutes (navigation laws) of the United States in force upon the 24th of August, 1912. In other words, the Attorney General held that the term net *registered* tonnage as used in the statute of 1912 was not the equivalent of the term net tonnage as used in the Panama tonnage rules; and that Congress in the act of 1912 had fixed the maximum rate of toll at $1.25 per ton net registered tonnage as determined by the statutes of the United States. Incidentally, the decision of the Attorney General fixed the maximum tolls payable by vessels in ballast at 75 cents per ton upon the vessel's net registered tonnage, American measurement.

In accordance with this ruling of the Attorney General, the Governor of the Panama Canal, on the 15th of March, 1915, issued an order continuing in force the schedule of tolls as fixed by the proclamation of the President dated November 13, 1912, but providing "that, if the sum obtained by multiplying the net tonnage thus obtained by the canal rules of measurement by $1.20 exceeds the sum obtained by multiplying the net registered tonnage, as obtained by the United States statutes, by $1.25, the excess is uncollectible."

Vessels are now required to be provided with

a certificate showing their net registered tonnage as determined by the United States statutes, and also their net tonnage as determined by the Panama Canal rules. The tolls are collected upon the net tonnage determined by the Panama Canal rules, unless the amount payable would be less at the rate of $1.25 per ton net registered tonnage, as calculated by the rules contained in the United States statutes. Vessels in ballast pay tolls at the rate of 72 cents per ton net tonnage, unless the amount thus payable exceeds what would be charged by collecting 75 cents per ton upon the vessel's net registered tonnage as determined by the statutory rules.

The effect of this necessary change in the application of the schedule of tolls has been a small reduction in the revenues of the canal. The administration of the tonnage rules and the collection of tolls are also more complicated because of the necessity of determining whether the payments under the rules and rates fixed by the President are greater or less than the amount payable at the rate of $1.25 per ton upon the net registered tonnage, United States measurement. It is easier for vessel owners, because of the unscientific and inaccurate provisions of the United States national tonnage rules, to evade the payment of tolls on spaces actually used. Inasmuch as the United States statutory tonnage rules are interpreted by

the Commissioner of Navigation, that official, who is not connected with the canal administration, can by his interpretation of the statutory rules decrease the canal revenues. It is desirable that Congress should so amend the act of August 24, 1912, as definitely to give the President full power to prescribe the rules for determining the tonnage upon which tolls shall be paid. A bill was introduced into Congress in 1915 and another in 1916 providing for this amendment. At the present time the bill is pending in the House of Representatives.

The existence of dissimilar rules in different countries and at different canals for the measurement of vessels is illogical and results in unnecessary burdens upon shipping. Many vessels are now obliged to provide themselves with several tonnage certificates. A vessel launched in an American shipyard, for instance, will need to have, in addition to its tonnage certificate made out in accordance with the requirements of the statutes of the United States, a Panama tonnage certificate, a Suez certificate, and probably British and German certificates. The argument in favor of a uniform system of tonnage measurement was admirably stated by the British Board of Trade in a memorandum prepared as early as 1862. The memorandum contained the following statement:

If one system could be adopted by all maritime nations, so that the capacity of any given ship, when once officially ascertained and denoted on her official papers, could be everywhere understood and recognized as valid, the advantages gained would be very great. The statistics of navigation would be rendered more simple, intelligible, and accurate. The merchant or shipowner would at once understand the size and capacity of the ships he employs or purchases; he would also escape the annoyance and expense of remeasurement; and, lastly, taxation, when imposed, would be rendered more simple and more just. Under these circumstances there can be but one opinion as to the utility, if not the necessity, of some general system of measuring merchant shipping.

Following the passage of the British Merchant Shipping Act of 1854, and the formulation of the Suez tonnage rules in 1873 by the International Tonnage Commission, efforts were made by the British Board of Trade to secure action by Parliament so changing the British rules for the measurement of vessels as to make possible the unification of the British and Suez rules, and consequently other tonnage rules. The efforts of the British Board of Trade and of others interested in the unification of tonnage rules were unsuccessful and nothing has recently been done in this matter. The importance of the subject, however, makes it desirable that further efforts should be made to bring about international tonnage uniformity.

The Suez and Panama rules differ in relatively minor details. They could without great change be brought into harmony with each other; and, when harmonized, the Suez-Panama rules would constitute a natural basis upon which to build an international code of measurement rules. Probably the major portion of the vessels engaged in overseas international trade will use the Suez or the Panama Canal or both. The Panama and Suez measurement codes are based upon sound principles and could logically be made the model of an international code.

The most effective method of inaugurating a movement for the international unification of tonnage rules would be for Great Britain, or for Great Britain and the United States jointly, to call an international conference to formulate a code to be recommended for adoption by the commercial nations of the world. The recommendations of such a conference would carry much weight, and if the recommendations were carried out by Great Britain and the United States, they would probably be adopted in course of time by other countries engaged in international maritime commerce.

CHAPTER XIV

COMMERCIAL ADMINISTRATION OF THE CANAL

By the Act of August 24, 1912, "the President is authorized . . . to govern and operate the Panama Canal and govern the Canal Zone . . . through a governor of the Panama Canal and such other persons as he may deem competent to discharge the various duties." The act also gives the President power "to make and from time to time amend regulations governing the operation of the Panama Canal, and the passage and control of vessels through the same or any part thereof, including the locks and approaches thereto, and all rules and regulations affecting pilots and pilotage in the canal or the approaches thereto through the adjacent waters."

"The President is also authorized to establish, maintain, and operate, through the Panama Rail Road Company or otherwise, dry docks, repair shops, yards, docks, wharves, warehouses, storehouses and other necessary facilities and appurtenances for the purpose of providing coal and other materials, labor, repairs, and supplies for vessels of the Government of the United States

and, incidentally, for supplying such at reasonable prices to passing vessels."

The administrative organization which the President, upon the recommendation of Major General George W. Goethals, has created for the operation of the canal provides for seven departments directly under the governor of the canal. The departments are the purchasing, accounting, executive, operation and maintenance, supply, health, and Panama Rail Road. The two departments having to do with the commercial administration of the canal are the "operation and maintenance" and the "supply" departments. One of the three parts of the department of operation and maintenance is the marine department headed by a marine superintendent who has direct supervision over the commercial administration of the canal.

As stated in the 1915 *Annual Report of the Governor of the Panama Canal,* the marine superintendent is "charged with the entry, conduct of vessels through The Panama Canal, and clearing them after transit, together with the supervision of the port captains, board of local inspectors, the pilots, the operation of lights and beacons, and the inspection and admeasuring of vessels." There is a captain of the port at Cristobal and another at Balboa, and these are the officials most directly concerned with the details of

the commercial administration of the canal. The captain of the port assigns vessels to wharves, provides for the docking and berthing of ships, furnishes pilot service, supervises the admeasurement of vessels, and has "general supervision and enforcement of the canal and harbor regulations relating to shipping."

The shops and terminal facilities and the mechanical operation of the canal are briefly described in Chapters XIX and XX of Sibert and Stevens, *The Construction of the Panama Canal.* It is not necessary to repeat what is stated in that excellent volume, and the following brief description of the way in which vessels are operated through the canal will suffice:[1]

> The handling of a vessel all through the canal, except in the locks, is essentially the same as its handling through any charted channel where observance of signals, ranges, and turns is necessary. The canal channel throughout is very accurately charted, fully equipped with aids to navigation, and governed by explicit rules with which the pilots, of course, are thoroughly familiar.
>
> In the locks, the vessel is under the control of the lock-operating force. As the vessel approaches the locks, the operator in charge at the control house indicates by an electrically operated signal at the outer end of the approach wall whether the vessel shall enter the locks, and, if so, on which side; or whether it shall keep back, or moor alongside the approach wall. If everything is

[1] *Official Handbook of the Panama Canal* (1915), pp. 20, 21.

ready for the transit of the locks, the vessel approaches the center approach wall, which is a pier extending about a thousand feet from the locks proper, lines are thrown out, and connections are made with the electric towing locomotives on the approach wall.

The vessel then moves forward slowly until it is in the entrance chamber, when lines are thrown out on the other side and connections are made with towing locomotives on the side wall. Six locomotives are used for the larger vessels, three on each wall of the lock chamber. Two keep forward of the vessel, pulling and holding her head to the center of the chamber; two aft, holding the vessel in check; and two slightly forward of amidships, which do most of the towing of the vessel through the chamber. The locomotives are powerful affairs, secured against slipping by the engagement of cogs with a rack running along the center of the track, and equipped with a slip drum and towing windlass, which allow the prompt paying out and taking in of hawser as required. No trouble has been experienced in maintaining absolute control over the vessels.

The water within the lock chamber proper, beyond the entrance chamber, is brought to the level of that in the approach, the gates toward the vessel are opened, the fender chain is lowered, and the locomotives maneuver the vessel into the chamber and bring it to rest. The gates are then closed, the water raised or lowered, as the case may be, to the level of that in the next chamber, the gates at the other end are opened, and the vessel is moved forward. Three such steps are made at Gatun, two at Miraflores, and one at Pedro Miguel.

When the vessel has passed into the approach chamber at the end of the locks, the lines from the towing locomotives on the side wall are first cast off, then those

from the locomotives on the approach wall, and the vessel clears under its own power.

Vessels require from 8 to 10 hours to make the transit through the canal, about 3 hours being spent in getting through the locks. In the sea-level channels and in Gaillard Cut, the speed of vessels is limited to 6 knots, but in Gatun Lake the speed may be 15 knots, except in portions of the lake where the channels are narrowed to 1,000 feet and less, and there the speed must be brought down to 12 and 10 knots.

The supply department is of great assistance to the owners and masters of vessels using the Panama Canal. The policy followed in the administration of the canal is to provide shipping, at reasonable prices, with all useful facilities and all needed supplies and repairs. The charges made for facilities and supplies have been fixed with a view to covering expenses, including overhead charges. The United States does not seek to make commercial profit in providing facilities and supplies.

As stated in Chapter XI, the Government has provided large coaling stations at Cristobal and at Balboa. The coaling plant of the Panama Canal at Cristobal has a stowage capacity of over 400,000 tons, while the plant at Balboa has a capacity of 200,000 tons. The coaling facilities are maintained by the Government to supply not only

the naval vessels of the United States but also merchant ships, American and foreign.

At the end of April 1916, the fuel oil stowage facilities at the Isthmus included the following tanks: At Cristobal are two tanks belonging to the Panama Canal, each having a capacity of 42,000 barrels. Private companies have six tanks each with 55,000 barrels' capacity and three tanks holding 37,500 barrels each. At Balboa the Panama Canal has two oil tanks, each with 42,000 barrels' capacity, while private concerns have two tanks each holding 55,000 barrels, four of 37,500 barrels, and one of 25,000 barrels' capacity. It is stated that the International Petroleum Company is about to construct two tanks, one holding 65,000 barrels and another 20,000 barrels. Moreover, the Panama Canal had awarded contracts for the construction of two additional 55,000 barrel-tanks, one to be constructed at Mount Hope and the other at Balboa. The large number of fuel tanks that have been constructed and are in process of erection indicates the rapidly growing use of oil instead of coal as fuel for steamers.

Some private companies carry a stock of Diesel engine oil at the Isthmus, but up to the end of April 1916, the Panama Canal had not begun to handle oil for Diesel engines. Should there develop a large demand for Diesel oil, the Panama Canal will, presumably, keep it in stock.

The prices at which coal and oil are supplied at the Isthmus by the Panama Canal and the policy of the canal authorities in supplying fuel are indicated by the following announcement which appears from time to time in the *Canal Record:*[1]

Coal is supplied to vessels at both Cristobal and Balboa at the rate of between 600 and 1,500 tons per day. Present prices are: At Cristobal, from lighters, trimmed in bunkers, or from cars alongside wharf, handled by ship's gear, per ton, $6.00; use of steam hoist and crane per hour, $1; at Balboa, the price is $1 more per ton, either form of delivery.

Fuel oil may be obtained at Balboa or Cristobal, from plants of the Panama Canal, or from private corporations. The present price from the Canal is $1.25 per barrel. Prices from the corporations may be obtained on application to them.

Diesel engine oil is for sale by several companies at approximately 50 shillings per ton of seven barrels.

The general supplies obtainable from the Panama Canal authorities at the Isthmus include practically everything that a vessel may need en route. "All standard lubricants, light and heavy hardware, cordage, and miscellaneous ship chandlery supplies are sold from the storehouses at Cristobal and Balboa." From the commissary department of the Panama Canal, merchandise and all kinds of food may be purchased, including

[1] *Canal Record,* April 19, 1916, p. 308.

fresh meats, vegetables, and fruit. Fresh water is sold at 25 cents per 1,000 gallons; and ice at 33 cents per 100 pounds. A vessel arriving at the canal may send its accumulated laundry by rail across the Isthmus and receive back the laundry on the same day, after the vessel has made the transit through the canal.

The large and fully equipped machine shops at Balboa enable the canal authorities to make repairs to vessels; and in the huge dry dock at Balboa, which was finished during the year 1916, it is possible to dock any vessel that can pass through the canal. Other services rendered vessels include towage at the terminals and, if necessary, through the canal. Pilotage into and out of the ports and through the canal is compulsory, but no charge is made for pilotage in the case of vessels that pass directly "through the canal without stopping at either terminal port to take on or to discharge cargo or passengers." This rule, however, does not prevent through passengers from landing. The cable and radio facilities at the canal are available for commercial uses at reasonable rates.

It is the policy of the canal authorities to provide shipowners with all useful information. From time to time "Notices to Mariners" are issued containing information regarding aids to the navigation of the canal; "Notices to Steamship

Companies" and "Sailing Directions" are published at intervals with a view to keeping shipowners fully informed as to the interpretations of the rules and as to other matters that may be of assistance to owners and masters of vessels operated through the Panama Canal.

The financial methods followed in the commercial administration of the canal are simple and impose minimum expenses and delays upon vessels using the waterway. As the *Official Handbook of The Panama Canal* states:

> For a steamship owner or agent to send a vessel through the canal is one of the simplest matters in all his business. Practically all he has to do is to make a deposit with the Government to cover the vessel's canal expenses. The Government will attend to everything else, and return his change as soon as the vessel has cleared from the canal.

Steamship companies and the owners of individual vessels may avoid carrying the cash required to pay tolls and to purchase supplies at the canal by making a deposit with an assistant treasurer of the United States at any of the larger ports of the country, and the assistant treasurer will cable to the Panama Canal giving notice of the amount thus placed on deposit. From the amount thus placed to the credit of the steamship company or shipowner, settlement may be made at the Isthmus for canal tolls and for whatever

supplies may be purchased. Shipowners in foreign countries may readily arrange through their banks for the deposit, with an assistant treasurer at an American port, of sums from which to make payments for tolls and to meet other expenses at the canal.

The Panama Canal authorities much prefer to have the shipowner deal directly with them instead of through the medium of a local agent. As the marine superintendent states in the 1915 *Annual Report of the Governor of the Panama Canal:*[1]

> Experience has fully demonstrated that the interests of vessels using the canal for transit and purchase of coal, supplies, provisions, and attendant services are much easier, better, and satisfactorily handled when placed in the hands of the canal authorities than when in the hands of local agents. In this respect, as well as in others, every effort has been made to eliminate any unnecessary or duplication of work and to make our business methods as simple as possible. To such an extent has this been accomplished that if owners or agents will follow our advice a vessel may automatically enter and pass through the canal without her master leaving his ship or signing a paper.

The admirable organization for the mechanical and commercial operation of the Panama Canal reflects the administrative skill and the exceptional foresight of Major General Goethals, the

[1] p. 224.

builder and first governor of the canal. A great engineer, aided by an able corps of trained assistants, has successfully accomplished an executive task of the first magnitude, and has thereby rendered a most valuable service to the commerce of the United States and other countries. It is especially fortunate that the operation of the canal was inaugurated by the man who directed its construction.

CHAPTER XV

WHAT HAPPENED WHEN THE SLIDES CLOSED THE CANAL

After the Panama Canal had been in operation for more than a year and the trade of the United States and other countries had come to depend upon the services and facilities afforded by the waterway, it was suddenly closed to all shipping. It remained closed until April 15, 1916, a period of seven months. The inconvenience and losses that resulted from the closing of the canal indicate concretely its usefulness to the commerce and industries of the United States and of the world generally.

In spite of the fact that international trade was greatly reduced by the Europeon War, the traffic through the canal had reached a relatively large volume before the waterway was closed by the slides that occurred September 18, 1915. During July of that year 170 vessels loaded with 705,000 tons of cargo were passed through the canal; and, although this was the largest traffic of any month preceding the closing of the canal, the volume for that month was not greatly above the

monthly average which the traffic had attained. During June, July, and August 1915, 474 vessels, carrying 1,884,000 tons of cargo, made use of the waterway. The sudden stopping of so large a current of traffic necessarily involved many expensive readjustments of industry and trade.

The readjustments could not be made immediately. During the three weeks following the date on which the slides occurred, more than 100 vessels, bearing 375,000 tons of cargo, arrived at the termini of the canal and were prevented from proceeding through the waterway to their destinations. Many more vessels would have reached the canal during these three weeks had not their sailings been canceled or their routes changed by the owners upon receiving notice of the closing of the canal.

The variety and value of the commerce interrupted by the closing of the canal are even more impressive than the volume of the trade affected. The traffic westbound between the Atlantic and Pacific ports of the United States is of much greater variety than that eastbound, but the manifests (some of which were published) of steamers that were held up at the canal en route from San Francisco to New York show that many kinds of articles were being shipped between the two seaboards and that some of these articles were of high value.

The *Ohioan,* of the American-Hawaiian Line, which sailed from San Francisco for New York, September 8, 1915, had in its cargo 49 different varieties of articles for New York and 38 different kinds of commodities for Boston. These were goods from San Francisco, and, in addition to them, there were large shipments of merchandise for New York and Boston from west coast ports north of San Francisco. The *Alaskan,* of the same line, which sailed from San Francisco for New York, September 16, 1915, had on board 62 different kinds of commodities for New York and 18 for Boston. This vessel also took out from San Francisco $385,000 worth of "bonded goods," which must have been imports being shipped to New York from foreign Pacific countries. The *Alaskan's* manifest shows that the lading included copper with a value of $33,750, dry goods valued at $35,095, hops at $22,700, potash at $23,911, wool at $240,293, and wine at $35,042. These few selected commodities give some suggestion of the value of the commerce interrupted by the closing of the canal.

When the Culebra slides suddenly closed the canal, an effort was made to substitute the Panama Rail Road for the canal as the agency for the transfer of freight from ocean to ocean, but it was at once realized that this single-track railroad was able to handle only a small part of the

traffic to be transported. By working seven train crews "in chain gangs, or rounds, first in, first out, on the through freight traffic, the railroad was able to handle between 4,000 and 5,000 tons of trans-isthmian freight daily." That, however, was barely equal to the average cargo of a single vessel. Most vessels were soon withdrawn from the coastwise trade between the two seaboards of the United States, but some lines engaged in foreign commerce via canal routes were continued in service; and the Panama Rail Road, while the canal was closed, transferred as much freight as possible in each direction between Cristobal and Balboa. The scarcity of vessels in ocean commerce and the irregularity of these sailings increased the difficulty of the Panama Rail Road and made the congestion more serious.

For a short time after the closing of the canal the Panama Rail Road transferred through traffic across the Isthmus at its regular classified schedule of rates for such traffic, but on the 6th of October, 1915, when it was realized that the canal would be closed for some considerable time, the Rail Road Company gave the steamship companies the option of a flat rate on through traffic of $3 per ton for all kinds of commodities. This flat rate, like the classified tariff, covered terminal services and the handling of freight out of and into vessels.

Only one company, the Luckenbach Steamship Company, which was engaged in the coastwise trade, availed itself of the $3 flat rate for all traffic. The vice-president of the Panama Rail Road Company, Mr. E. A. Drake, states that "in addition there were some individual instances of its use for single lots of cargo, but every other line engaged in transshipping through cargo elected to avail of the option that was publicly offered them to select the classified rates which have since applied to all cargo transshipped including cargo en route under bills of lading dated up to April 14th [1916]."

Mr. Drake also states that "with the reopening of the canal the transshipment of cargo, in which the railroad was temporarily engaged in discontinued." It should be explained that when the canal was opened in 1914, the Panama Rail Road ceased to transport through traffic, all such traffic being required to use the canal. The Panama Rail Road has, however, established, "applicable to any future interruption of canal traffic, a uniform classified tariff that will apply indiscriminately to all cargo transshipped whether domestic or foreign. The discrimination in past years in favor of coastwise traffic was maintained under the most adverse criticism from foreign interests and is now effectually done away with."

The closing of the canal imposed a large ex-

pense upon traffic across the Isthmus. The tolls charged for the use of the canal amount to about 90 cents per ton of cargo, on the average, and thus the closing of the canal added at least $2.10 per ton to the cost of getting cargo across the Isthmus. This, however, was only a small part of the expense that commerce had to bear. The most serious burden was due to the delay to traffic, to the uncertainty of the services that could be secured from the railroad, and to the inability to ship more than a small amount of freight, even at the higher costs of transportation, under the adverse conditions that prevailed.

The Culebra slides, with the consequent closing of the canal, could hardly have come at a more inopportune time. The industries and trade of the United States, after about three years of business depression, had entered upon a period of exceptional prosperity in August 1915. Transportation facilities within the United States proved inadequate to handle the tonnage offered to the railroads. Ocean shipping was entirely incapable of moving the exports and imports; and the congestion of freight at the terminals and in the yards of American railroads was made more serious by the closing of the canal route to coastwise carriers and to shipping engaged in the foreign trade of the United States. The closing of the canal made a bad situation worse and prolonged

the period of traffic congestion in the United States.

It is obvious that the closing of an interoceanic highway like the Panama Canal would have a world-wide effect upon commerce and industry. For example, sugar from Hawaii for the refineries at Philadelphia and New York, instead of moving over the short route via Panama, had to be sent around South America, or be transferred to the railroads at the Pacific seaboard of the United States for expensive transportation more than 3,000 miles by rail across the continent. The Bethlehem Steel Company, at South Bethlehem, Pa., was prevented from securing ore from Chile and had to obtain ore at higher cost from Michigan and Minnesota. Indeed, the company has been unable to secure ore in sufficient quantity and has been obliged to buy pig iron.

The effect of the closing of the canal upon the manufactures of the United States is illustrated by the difficulty that was experienced in shipping locomotives, boilers, and wheels to the Far East for delivery to the Manchurian and Siberian railroads. Long after these locomotives should have been on the way to their destination they were in the cars on the tracks of the Jersey Central Railroad, adding to the already serious congestion in the railroad yards. Munitions manufactured in Bridgeport, Connecticut, for delivery in the Far

East accumulated in the railroad yards at Bridgeport and increased the difficulties experienced by the New Haven Railroad in keeping its line and terminals from being completely choked up. Illustrations similar to these might be cited in great number.

An interruption to business such as was caused by the closing of the Panama Canal results in large direct and indirect losses to men engaged in many lines of business. Mention may be made of the fact that manufacturers of iron and steel in the eastern part of the United States had contracts to deliver their products to consignees on the Pacific coast of the United States and in foreign Pacific countries. These contracts were made upon the assumption that the goods could be shipped via the canal at much lower freight rates than were obtainable after the canal was closed. Numerous business men on both the Atlantic and Pacific seaboards of the United States found that the business which they had built up by making use of the services through the canal had to be abandoned when the canal services were discontinued. What they had spent in building up the business was lost wholly or in part.

With the reopening of the canal, the trade that was interrupted by the closing of the waterway is being resumed, as far as possible; but when shippers lose trade to competitors it usually takes

time to regain the business. Moreover, the opening of the canal will not immediately restore the conditions that prevailed prior to September 1915. The vessels that were being operated through the canal have been put upon other routes and employed in other services, and the facilities for transportation between the two seaboards of the United States via Panama will be less in 1916 and 1917 than they were during the first eight months of 1915.

This will be the most serious consequence of the closing of the canal. The slow return of vessels to Panama routes will keep the revenues, obtained by the Government from canal tolls, small in comparison with what they would have been had the traffic continued uninterruptedly to develop at the rate it was increasing during the first eight months of 1915. The slides have not only added many millions of dollars to the cost of constructing the canal, but have cut down the returns which the people of the United States will receive from their large investment. During July and August 1915, the last two full months that the canal was operated before being closed by the slides, the tolls earned by the canal amounted to $1,070,157.

The losses sustained by the Government, however, are of much less importance than those incurred by the manufacturers and traders of the United States whose business depends upon the

transportation facilities afforded by the canal. The losses sustained by individuals cannot be so definitely measured as can the losses in tolls, but they must have been larger and of more serious consequence.

The tonnage of shipping engaged in the international trade by way of the canal will be much less during 1916 and during the continuance of the European War than it was at the time the slides temporarily put the canal out of service. In April 1916, Mr. H. E. D. Jackson, vice-president of the American-Hawaiian Steamship Company, in testifying before the Interstate Commerce Commission, stated that the company had been compelled to discontinue its intercoastal services not only because of the closing of the canal by the slides, but also because the prevailing rates by rail between the two seaboards of the United States made it necessary for vessels in the coastwise trade to charge lower rates than could be obtained by placing their vessels in the foreign trade. Under existing conditions the company finds it more profitable to operate or charter their vessels in the foreign trade. Concerning the disposition made of the vessels early in 1916, Mr. Jackson testified:

> We chartered three of our vessels the other day to the United States Steel Corporation for a year, at much higher figures than we had ever obtained by operating

them. Four of our vessels are under charter till December 1917, three are chartered for a year, and the others are chartered for from three to six months each, with ample opportunity for renewing the charters as they may expire.

Although vessels are now being built for the American-Hawaiian Steamship Company, these vessels will not go immediately into the canal trade, because of the greater revenues to be obtained in foreign commerce. Special reference is here made to the American-Hawaiian Steamship Company because it is by far the largest steamship line that has been engaged in the intercoastal trade. During the twelve months ending with the first of July 1915, this company carried 55.57 per cent. of the trade from the Atlantic ports of the United States through the canal to California terminals. At the present time the company has a fleet of 26 vessels, the number of which will be increased with the vessels now under construction.

The second largest steamship line that has been in the intercoastal service is the Luckenbach Steamship Company which regularly has a fleet of 10 vessels, and which operates an additional number of vessels under charter as its business may require. Mr. H. P. Hamilton, general manager of the Luckenbach Steamship Company, in testifying at the hearings above referred to, stated that the Luckenbach Company will probably not resume the

coast-to-coast service during the next two years. This company, during the year ending July 1, 1915, carried 29.64 per cent. of the traffic from Atlantic ports through the canal to California terminals. The testimony of these officials of two steamship lines that were developed with reference to the intercoastal trade, and which before the closing of the canal carried the larger part of the commerce coastwise between the two seaboards of the United States, is rather discouraging as to the early resumption of the intercoastal business via the canal.

With the restoration of peace and the return of commerce to its usual volume and to its customary routes, and with the decline of freight rates to a fairly normal level, the traffic of the Panama Canal may be expected to overcome the setback it has suffered because of the war and in consequence of the closing of the waterway for a long period while the war was in progress. The present unhappy state of the world must be temporary, and, when commerce is again permitted to expand, the use of the canal will increase with the growth of international trade.

It is to be expected, however, that the demand for ships will be greater than the supply and that ocean freight rates will be high for some time after the close of the European War. If these conditions prevail, vessels will not quickly return

to the intercoastal trade of the United States where carriers by water must make rates in competition with railroad rates that are subject to government control; but, at most, the restoration of the interrupted coastwise trade through the canal can only be delayed. Indeed, the turn of the tide from ebb to flood may come sooner than present conditions would indicate. It is to be hoped that this may come to pass.

INDEX[1]

Administrative organization of canal, 266
American-Hawaiian Line, abandons Magellan route, 13
beginning of, 13
fleet of, in 1915, 55
makes use of Tehuantepec route, 31, 71, 74
opening of service via Straits of Magellan, 25
services of, through the canal, 54
traffic of, via canal, 286
American marine, the canal and the, 133-148
Australia, advantages of United States ports over European ports in commerce with, 44
commerce of United States with, 16
competition of Europe with United States for trade of, 126
distances to, via canal, 153, 157
effect of canal upon United States trade with, 130
movement of commerce to, from United States and Europe, 152
shortening in distances to, from United States via canal, 42
Canada, effect of canal upon trade of, 157
Cargo ton, two classes of, 212
why tolls should not be based upon, 242
Casimir-Perier, C., investigation of effect of Panama Canal on Suez Canal traffic, 174
Central America, commerce of, with United States through the canal, 124
increase of trade with, by canal, 156
See also South America
Chartered vessels, deviation in routes by, 181
China, characteristics of United States trade with, 128
See also Far East and Orient
Clayton-Bulwer Treaty, 159
neutrality clause in, 161
Closing of canal causes increase in transportation costs, 281
effect of, upon coastwise shipping, 284
upon commerce and industry, 282
financial loss by, 284
Coal, comparison of prices of, along different routes, 197

[1] Unless used with a qualifying word, "Canal" in this index refers to the Panama Canal.

Coal, how price of, is regulated, 192
illustration of actual cost for, via Panama and alternative routes, 203
less in price at Panama than at Suez, 190
price of, at canal, 196, 271
relative steaming values of, 199
supply stations for, on various routes, 202
wide differences in price of, 183
Coaling stations, at canal, capacity of, 195, 270
of the world, by whom maintained, 191
map of, facing 192
Coastwise carriers, competition of transcontinental railroads with, 74, 82
Coastwise commerce, restricted to American vessels, 134
Coastwise lines, comparison of rates charged by, 89
rate policy followed by, 89
Coastwise shipping, effect of free tolls on, 232
Coastwise trade, continuance of present policy towards, advocated, 140
increase in vessel tonnage for, 139
Commerce, dependent upon effective merchandising methods, 119
percentage of, over six general routes via canal, 47, 53
Commercial administration of the canal, 265-275
Competition of the Suez and Panama routes, 168-182
Construction of Panama canal, beginning of, 3
geographical reasons for, 10
most potent influences for, 11
purposes of, 112
reasons for, 7, 18, 69
Cost of canal, 218
Cotton, shipments of, through canal, 109
Crew accommodations, deductions for, 251
Culebra, slides at, in 1915, 53
effect of, 279-288

Danube rule, for propelling power deductions, 247
Deck cargo, how treated in tonnage rules, 253
Deductions for determining net tonnage of vessels, 246
De Lesseps, canal concession obtained in interest of, 11
Diesel marine engine, use of, 187
Displacement tonnage, defined, 210
Distances, not the only determinant of ocean routes, 172
points equally distant from New York and Liverpool, 40
Domestic trade and industries of the United States, effect of the canal upon, 94-111

Europe, benefit to, from canal, 154
changed conditions of competition between United States and, 151

Europe, commerce through canal between United States and, 100
commerce of, between South and Central America through canal, 100
interest of, in canal, 150-166
services from, to North and South America via canal, 63
European Commission of the Danube, 250
European ports, saving in distances from, via canal, 36
European War, abnormal demand for supplies created by, 52
diversion of vessels on account of, 60, 67
effect of, on traffic via canal, 50, 51, 52, 176, 229, 230, 285, 286
increases tonnage of American deep-sea fleet, 134

Far East, commerce of United States with, via canal, 179
distances to, 152
route of commerce to, 167
services to, via canal from United States, 65
trade of eastern United States with, chiefly via canal, 177
See also Orient
Financial methods followed in canal administration, 273
Foreign trade, concrete effects of canal upon, 132
need for international banking facilities in, 120
of the United States, the canal and, 112-132
Foreign trade, relation of canal to, 122
removal of handicap on, 136
tonnage of American merchant marine in, 135
Fortifications, 19, 219
Freight rates, the canal and, 69-93
on intercoastal traffic, 222
See also Rates
French Canal Company, reasons for failure of, 3, 11
Fuel oil supply at canal, 270
Fuel supplies and costs via the Panama Canal and alternative routes, 183-207

Gaillard Cut, slides in, 28, 279-288
Goethals, Major General, administrative skill of, 266, 274
Gold, discovery of, in California, 1, 24
Gorgas, General, sanitation work of, 4, 6
Grace, W. R. and Co., services of, via canal, 58, 65
Gross tonnage, how determined, 211
problems concerned with determination of, 245
why tolls are not based upon, 241

Hay-Pauncefote Treaty, 158
neutrality clause in, 163

"Industrial line," services of, 48
Industries, American, relation of canal route to development of, 105
service of canal to, 107

Industries and domestic trade of the United States, effect of the canal upon, 94-111
Intercoastal traffic, rapid growth of, 13
a typical vessel cargo, 278
volume of, to September, 1915, 96
See also Traffic
International Tonnage Commission, 250
International trade, requisites for, 114, 115, 116, 120
subject to worldwide competition, 114
transportation a controlling factor in, 115
Isthmus of Panama, map of, showing canal, 22

Japan, difficult for American producers to increase exports to, 128
See also Far East and Orient
Japanese steamship line, service by, through canal to New York, 178

Line traffic, services of, 51, 66
Luckenbach Company, services of, through canal, 58, 286
Lumber shipments, 110
special type of vessel for transportation of, 60

Marine engines, two types of oil consuming, 187
Measurement rules, when promulgated, 235
Measurement tonnage defined, 213
Merchant marine, decline in, after Civil War, 136
legislation for, imperative, 147
proposed measures for development of, 143
tonnage of, in foreign trade, 135
Morgan Line, establishment of, 79

National City Bank, establishment of foreign branch banks by, 121
Navy, American, canal of much benefit to, 160
merchant marine, the foundation of, 141
strengthened by canal, 20, 21
Net tonnage, how determined, 211
the basis for tolls, 237
Neutrality of canal assured, 20, 113, 159, 163, 164
New York, distances from, via canal, to Australia, 43
to Orient, 39
New Zealand, situation of, with reference to canal routes, 45
See also Australia
Nicaragua Canal, beginning of a, 2

Ocean routes, around South America, 7
distance not only determinant of, 26
economy of shortening, 29
interlacing of, in the Orient, 173
saving in, via canal between United States and Europe, 33

Ocean routes, shortening in, between United States and Australia, 42
three main considerations influencing choice of, 169
traffic, a chief factor affecting, 27
Ocean voyages, the canal and the length and time of, 24-47
Oil, use of, in marine engines, 184, 187
Oregon, long voyage of, in 1898, 21
Orient, commerce of United States with, 16
competition of Europe with United States for trade of, 126
concrete illustration of saving in voyages to, via canal, 38
major share of United States commerce to, via New York, 39
nature of exports from, to United States, 181
saving in distances to, from United States, 37
See also Far East

Pacific countries, competition for trade of, 153
importance and possibility of trade with, 17, 18
Pacific railroad, the first, 73
Panama and Suez routes, competition of the, 168-182
Panama and Suez tonnage rules, comparison of, 252
Panama Canal, and the length and time of ocean voyages, 24-47
Panama Canal, annual operation and maintenance cost of, 227
blockaded by slides September 1915, 28
closing of, readjustments in shipping made necessary by, 277
commercial administration of, 265-275
comparatively near coal and oil fields of United States, 188
cost of, 218
domestic trade and industries of the United States and the, 94-111
effects saving in fuel costs for vessels, 186
Europe's interest in the, 150-166
facilities for fuel at, 196
first vessel of commerce through, 94
foreign trade of the United States and the, 133-148
freight rates and, 69-93
fuel supplies and costs via, and alternative routes, 183-207
services through the, 48-67
tolls, 208-234
tonnage rules, 235-264
what happened when slides closed the, 279-288
why it was built, 7-23
Panama Canal Act, enacted, 142
interpretation by Attorney General of section regarding tolls and result thereof, 259
Panama Canal Company, organization of, 149

Panama-Pacific Line, canal service of, 59
Panama Rail Road, opening of, 2, 25
traffic via, when canal was closed, 278
Panama, Republic of, treaty with, 164
Panama tonnage rules, the, 235-264
Penrith Castle, advantages obtained by, in using canal for trip to Orient from United States, 38
Percentage rule, for propelling power deductions, 246
Petroleum oil, tank vessels for transportation of, 61
Philippine Islands, effect of canal upon United States trade with, 131
Pilotage, 272
"Prairie schooners," 24
Propelling power deductions, two rules for, 246

Rate groups, map of, 78
Rate zones, map of, 76
Rates, freight, the canal and, 69-93
blanketing of, 77, 80
cites from which back haul rates may be calculated, 87
comparison of, charged by coastwise lines, 89

San Francisco, distances from, via canal, 32
Sanitary work, at Isthmus of Panama, 3
in Cuba, 4
Services through the canal, 48-67
Shelter deck spaces, treatment of, in determination of gross and net tonnages, 252
Ship Registry Act, 136
Shipbuilding, contrasted in United States and United Kingdom, 137
Shipping board, suggested duties of the proposed, 145
Shipping business, governed by complex body of navigation laws, 145
Slides, what happened when they closed the canal, 279-288
South America, commerce of, through canal between Europe and, 100
commerce of, with United States through canal, 100, 124
exports and imports of, 14, 15
geographical relation of, with North America, 8, 123
high cost of coal on east coast of, 206
ports, saving in distances to, via canal, 34
services to, from Europe via canal, 64
from United States, 65
trade of, mainly with Europe, 122
Southern States, products of, through canal, 108
"Steam schooner," for transportation of lumber, 60
Suez Canal, effect of opening of, 94

Suez Canal, investigation regarding effect of Panama Canal upon traffic of, 174
neutrality of, 20
opening of, 10
rate of tolls at, 231
Suez route, supply of coal along, 193
Suez and Panama routes, competition of the, 168-182
Suez and Panama tonnage rules, comparison of, 252
Suez tonnage rules, when formulated, 263
Supply department at canal, 269

Taft, President, statement by, regarding financial management of canal, 217
tolls proclamation by, 209
Tehuantepec, Isthmus of, cost of transferring traffic at, 71
Tehuantepec route, American-Hawaiian Line, changes to, 31
opening of, 25
Tolls, Panama Canal, 208-234
amount of, during first 13 months of operation of canal, 230
based upon net tonnage, 213
effect upon, of ruling of Attorney General, 259
fixing of, an instance of transportation rate making, 219
law repealed regarding exemption of, on coastwise vessels, 142
methods of levying, 210
Tolls, policy followed in fixing schedule of, 217, 232, 236, 239
proclamation regarding, by President Taft, 209
rate of, 208, 231, 236
relation of, to freight rates, 222
vessel charges in relation to, 223
why not based upon size or weight of vessels, 240
Tolls, Suez Canal, rate of, 231
Tonnage, cargo, 212
dead-weight, 211
displacement, 210
gross, 211
measurement, 213
net, 211
Tonnage measurement rules, need for uniform system of, 262
when promulgated, 235
Tonnage ratios under Panama and Suez rules, 214, 256
Traffic, amount of, through canal, for first 13 months, 230
distribution of, over main canal routes to September, 1915, 99
how handled by vessels, 48
interfered with, by European War and Culebra slides, 229
major share carried by regular carriers' lines, 50
tonnage of sixteen principal commodities shipped through canal to September 1915, 103
two special types of vessels used in, 60

See also Intercoastal Traffic
Transcontinental railroads, competition of, with coastwise carriers, 74, 82
Transcontinental rate policy, determination of, by Interstate Commerce Commission, 91
Transcontinental rates, as adjusted by Interstate Commerce Commission, 84-88
special characteristics of, at opening of Panama Canal, 74
Transisthmian routes, early surveys of, 2
Transpacific countries, commerce of the United States with, through canal, 101
Transportation, a controlling factor in international trade, 115
cost of, between two seaboards of United States lowered by canal, 93
effect of canal on costs of, 68, 70, 72
Treaty, Clayton-Bulwer, 159
Hay-Pauncefote, 158
with Republic of Panama, 164

Vessels, actual cost of coal for, via Panama and alternative routes, 203
admission of foreign built, to United States registry, 133, 136
Vessels, cargo space in, affected by fuel used, 185
diversion of, to other routes on account of European War, 60, 67
engine room in, 249
gross tonnage of, in coastwise trade and on Great Lakes, 134
method of handling, through canal, 267
of many types, 216
provision for repairing, at canal, 272
supply of coal to, along various routes, 201
time of transit for, through canal, 269
tonnage, kinds of, 210
traffic conditions controlling routes of, 173
transfer of, to other routes by closing of canal, 284
two large items of cost of operating, 170
types of, used in canal traffic, 60

Warships, designation of tonnage of, 217
tolls for, using Suez Canal, 236, 257
Whaling fleet, first voyage of, to Pacific coast, 1
West Coast States, large use of canal made by, 110
Wool, economical shipment of, through canal, 107

Yellow fever, control of, at Panama, 5

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